# A MULTIDIMENSIONAL STUDY OF THE INTRINSIC LARYNGEAL MUSCULATURE

BY

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To D.V.H., K.F.H., and D.K.H.

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A Dissertation Presented to the Graduate School
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BY

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Chairman: Thomas B. Abbott, Ph.D.
Major Department: Speech

The study of laryngeal anatomy has a long history. It has examined cartilaginous framework and later muscular composition. Laryngeal replicas were modeled out of wax to depict structure. Laryngeal material was also embedded in various mediums and sectioning ensued. Recognizing early examination of the larynx has been fairly extensive, the crucial question becomes what new information may be gathered as a result of the current study? The current study attempts to assess the feasibility of generating intrinsic laryngeal musculature measurements from photographic slides of the remaining celloidin embedded block in adult male disease-free specimens cut in multiplanar serial section. It also is an attempt to follow size, configurational and relational changes in the intrinsic laryngeal musculature. A total of six celloidin embedded topically stained specimens were dissected via coronal, sagittal, and transverse planes,

respectively. Area, perimeter, height and width measurements were made of the soft tissue structures of interest when clearly present. Structures void of discernible boundaries were not measured in a particular slide and this accounts for the disappearance and reappearance of a structure in the tabular data found in the appendices. Shrinkage data were generated in an attempt to determine the approximate amount that muscular tissue shrinks as a result of the chemical processes of fixation, decalcification and dehydration. These measurement values taken together with the shrinkage data yield a normative data base closely representative of in vivo conditions.

Tabular data are presented in three forms. First, tabular data are presented in a progressive slide by slide sequence in which all structures of interest shown in the sectional plane are delineated by name and measure. Secondly, individual intrinsic laryngeal muscles are identified and measured as they are presented throughout a given specimen. This information is combined with the serial laryngeal illustrations. Finally, as a result of the chosen plane of dissection, one dimension is not measurable. The last set of tables presents a summation of range of structures of interest in the missing dimension. It is entirely likely subsequent studies may expand the quantity and type of measurements generated.

# CHAPTER I
# BACKGROUND AND PURPOSE

## Introduction

A perusal of a number of anatomical texts indicates the larynx often receives a rather cursory presentation. The superficial descriptions many times result in both extrinsic and intrinsic laryngeal musculature being addressed in a few paragraphs (Anderson, 1984; Anthony & Thibodeau, 1979, 1980; Basmajian, 1980, 1982). Frequently the information available on the larynx requires the reader to seek additional sources (Burke, 1980; Crouch & McClintic, 1971; Gardner et al., 1963). This type of discourse demonstrates the need for detailed treatment. The anatomy texts are likely to be the major source of enlightenment and initial contact for many students and unfortunately the superficial treatment of the larynx prejudices students about the importance of this vital organ. These texts properly concentrate their limited presentations on the structure of the larynx, and although that information is often incomplete, the question of function or physiology may be totally omitted (Ellis, 1976; Ellis & Feldman, 1977; Evans, 1976; Francis & Martin, 1975). A few texts provide a limited improvement of laryngeal information (Christensen & Telford, 1972; Dienhart, 1979). However the general dearth of illuminating information perhaps suggests that the larynx has not been regarded as a particularly important organ. Although it

has specific biological functions, the larynx is the primary organ of speech and deserves a less circumscribed and more comprehensive treatment. It is regrettable so few texts in comparison to the number of texts available provide the reader a firm foundation in laryngeal anatomy and physiology.

The purpose of this study was to examine the intrinsic laryngeal musculature revealed by multiplanar serial sectioning of the celloidin block. The end product would be a better understanding than is currently available of laryngeal structure as revealed by the techniques utilized in this study.

## Review of the Literature

### The Advent of Laryngeal Awareness

The larynx has been a subject of inquiry for centuries. The literature demonstrates an early keen interest in the larynx. There exists various citations crediting dissimilar sources with discovery of diverse aspects of the larynx (Andrews & Badger, 1979; Canalis, 1980; Cooper, 1985; Fink, 1975; Whicker & Devine, 1972). These sources run the gamut from identification of the larynx as an entity in the body to labeling of cartilaginous and soft tissue structures. There has also been speculation regarding function, and actual physiology is a separate issue. As a consequence of the scientific question under consideration, the historical perspective reflected differs. Some sources cite Hippocrates (Whicker & Devine, 1972) as the initial laryngeal investigator. Hippocrates was purportedly interested in function (Andrews & Badger, 1979; Whicker & Devine,

1972). It has been suggested that several hundred years elapsed between the first and second individuals to address the larynx. The first to identify the larynx is thought to have been Aristotle (Fink, 1975) and the second, Galen (Fink, 1975; Whicker & Devine, 1972). Whicker and Devine (1972) credit Galen (192 A.D.) with referencing the thyroid, arytenoid and cricoid cartilages. Galen is also purported to have believed each muscle throughout the entire body possessed a distinct function and he did attempt to designate function for the laryngeal musculature. Galen is considered to be the father of early anatomical dissection. His concepts remained widely employed and undisputed for centuries.

Leonardo da Vinci (1452-1519) perhaps was the unheralded anatomist of his period (Fink, 1975; Whicker & Devine, 1972). Da Vinci believed the voice to be related to the larynx. To support his theory da Vinci removed certain organs--the larynx, lungs and trachea as a unit and forced air out through the trachea and lungs. Da Vinci believed, in a live subject, this same action would result in voice. Another early advocate of laryngeal study was Vesalius (Fink, 1975; Whicker & Devine, 1972). Prior to his departure from the University of Padua in 1543, Vesalius contributed much on the subject of many different organ systems, including the larynx. Still another advocate of laryngeal study was Bartolomaeous Eustachius (Fink, 1975; Whicker & Devine, 1972). His contribution was that of laryngeal drawings. Although Eustachius lived in the 1500s, his work was not revealed until the 1700s. Studies often ascribed specific functions to certain laryngeal musculature. Sometimes these ascribed functions were not

the result of conclusive empirical investigation and later were proven to be incorrect. Galen's work was ultimately subject to challenge. One such example is found in the case of Casserius (1601) who disproved Galen's theory on pitch (Fink, 1975). Other researchers besides Casserius were also concerned with pitch. Dodart (1634-1707) addressed the issue of pitch modulation and considered pitch to be controlled by glottal tension and width. Perhaps even more profound was the idea postulated by Winslow (1756) which supported consideration of the laryngeal musculature functioning together as a single unit. This concept circumvented the abyss of single muscle and single action only theories. In 1724 the corniculate cartilages were designated as additional entities in the laryngeal cartilaginous framework by Santorini (Fink, 1975). Not quite 60 years later the cuneform cartilages were identified. There is some discrepancy as to whom the credit for this identification belongs, either Wrisberg (1780) or Wrisberg's deceased associate Haller (1778), or even Camper (1767) (Camper, 1779; Fink, 1975; Haller, 1973). The identification of the cuneform cartilages probably should be credited to Camper (1767) who did publish this information in 1779 and who apparently was acknowledged by others prior to that publication as having identified the cartilages. Giovanni Battista Morgagni (1682-1771) for whom the ventricle of Morgagni is named studied various pathologies and the resultant changes in anatomy. Particular areas of emphasis were areas important for speech, the pharynx, larynx, and the palate (Canalis, 1980; Whicker & Devine, 1972). Significant anatomical identification continued. Still later Francois Magendie discovered, by approximating

the arytenoid cartilages and blowing air into the larynx that sound could be produced (Whicker & Devine, 1972). Hence, in Magendie's lifetime, late 1780s to late 1880s, the issue of laryngeal function was again addressed. Studies following Magendie began to look more closely, even explicitly, at function. The first successful indirect laryngoscopy was self performed by Manuel Garcia in 1855 with the use of mirrors and sunlight. Laryngoscopy and the means by which to achieve it generated a widespread interest. For the first time man had a means of viewing the interior of the larynx and movements of the vocal folds and arytenoid cartilage movement. Garcia (1855) and then Czermak (1861), who used lighting sources other than sunlight, conducted laryngeal inspections which led to detailed descriptions of intrinsic laryngeal activity. Czermak (1861) illustrated the differing types of glottal activity such as closure during certain biological functions which he observed.

Early studies of the larynx were consistent with the level of scientific knowledge and instrumentation available. As the base of scientific information has been augmented, the refinement of skills and investigative methods have reflected scientific and technological advancements. Further, the types of questions which can be addressed today are appreciably different from earlier times. Perhaps the questions are not intrinsically more difficult, but certainly they are more technical. The scientific method employed dictates, limits, or influences the types of results derived as well as their interpretation. A review of the 20th century literature elucidates the relationship between the state of the art and the type of research

conducted. The technique at issue for this study is celloidin embedding followed by serial sectioning when applied to laryngeal material. The assumed position is such that a slice by slice progression through the larynx yields an appreciation of the component parts.

Laryngeal Investigation: Anomaly and Disease

There is very little available research which has concerned itself with sectioning of the larynx via a specific plane. A thesis project conducted by Jean Robert-Leroux (1936) was probably the first study to incorporate serial sectioning in cancerous specimens. This study followed the patient's preoperative course with direct and indirect laryngoscopy, x-ray evaluation, surgical procedure, and postoperatively with serial sectioning and histological examination of the laryngeal specimens. The major emphasis of that study was the location and extent of the tumor. The availability of such information was and still is a useful learning tool.

As early as 1943 a study conducted by Broyles examined the anterior commissure tendon. Broyles (1943) concentrated on the anterior commissure tendon because he believed an area with "weak" or "deficient" cartilaginous protection was susceptible to disease. Particular attention was given to squamous cell carcinoma. Cross sections were made of the anterior commissure and surrounding tissue and thyroid cartilage in two carcinoma specimens, a young adult and a 62 year old male. Broyles (1943) concluded that carcinoma occurring in the anterior larynx and reoccurring should be examined closely. In the event that a "midline incision of the thyroid cartilage" was the

surgical technique employed, a return of carcinoma should not be viewed as a recurrence, but rather as a continuation. The growth would be suspect of having been in the tendon itself or its "insertion into the thyroid cartilage" (p. 344).

Kernan (1951) studied laryngeal carcinoma via horizontal celloidin embedded serial sections. The specimens were derived from patients whom he had followed throughout the course of their treatment. Kernan (1951) was most concerned with illustrating the insidious nature of subglottic carcinoma and the failures of too conservative surgery or inappropriate use of radiation therapy as forms of treatment. Serial sectioning and histologic techniques were used on the resulting specimens. Kernan (1951) concluded that treatment failures need to be studied in depth.

Kelemen (1953) investigated congenital laryngeal stridor in four newborns. He also had a control group consisting of laryngeal specimens from four normal newborns. Dissections were parallel for each group. Three larynges were sectioned in the horizontal plane and the fourth was dissected in the "frontal plane" (p. 246). Specimens were infiltrated with celloidin before cutting. The horizontal sectioning resulted in 640, 800, and 900 sections respectively. Sectioning for the frontal plane required a midsagittal split, with the right side of the larynx further divided into 340 slices. A hematoxylin and an eosin stain were used on every tenth horizontal slice. Staining for the frontal plane employed Van Gieson and Gomori stains in addition to the previously mentioned hematoxylin and eosin

stains. Kelemen (1953) concluded that anatomical anomalies were present and accounted for the stridor.

Further Refined Investigative Techniques

G.F. Tucker, Jr. (1961) utilized histologic methods to determine a more precise classification system delineating the limits of carcinoma. He believed a better system was necessary as some systems omitted the submucosal structures. Hence, a more universal system would be desirable. The clinical means of determining the extent of the lesion depends on the absence of fold mobility. Tucker (1961) pointed out a classification system based on dissection is far more specific. For this reason Tucker (1961) conducted a coronal serial section laryngeal dissection of celloidin embedded specimens. Specimens were cut on a Spencer microtome following a modified decalcification, dehydration and embedding procedure. A variety of different stains was used. Tucker (1961) concluded that coronal serial sectioning allowed the inspection of a tumor in relation to the remaining healthy structures. It also permitted speculation as to the initial disease locale prior to the spread of the disease.

Livingston et al. (1976) developed a rather innovative means of studying structure. Although concerned with the brain, horizontal slices were studied via filmed computer graphics. This technique was applied to various brain structures throughout the horizontal slices. The advantage of using computer graphics is that it enables the entire brain to be represented in a three-dimensional fashion as well as allowing the viewer the flexibility of visualizing the brain externally or to travel through the inner structures.

Michaels and Gregor (1980) conducted a study which compared their own method of laryngeal preparation and dissection to the more traditional time proven methods. Their method consisted of fixation in a 10% buffered formol saline for a minimum of 2 days after which the specimen was sectioned serially on a meat slicer. Michaels and Gregor (1980) judged their method superior by virtue of less chemical intervention as well as the option of leaving the specimen whole prior to dissection. This technique was used with both normal and diseased specimens.

Gregor et al. (1980) addressed the efficacy of using computed tomography (CT) as a noninvasive means of studying the larynx. This group took various laryngeal sections and compared the pathological findings via conventional tomography with those obtained by CT scan. Their results indicated that particular areas were better evaluated through the use of the CT scan, ". . . an accurate assessment of laryngeal anatomy and involvement by tumor, particularly of the pre-epiglottic space, paracordal area, anterior commissure, and cricoarytenoid area [and] . . . the presence of anterior or posterior commissure involvement is of paramount importance in precluding the possibility of conservative laryngeal surgery" (p. 291).

Hicks (1981a, b) made various measurements of 31 laryngeal specimens to establish normative data documenting changes in the larynx over the decades of life. His particular hypothesis also addressed the possibility that these changes occurred as a result of the aging process. Specimens were derived from both male and female subjects ranging in age from 47 to 90 years of age. A total of 54

separate measures were taken. These measures were primarily linear although one measure was angular and six concerned weight. Structures of particular interest were the vocal folds, hyoid bone and laryngeal cartilages. Hicks (1981a, b) concluded specimens derived from female subjects were in all cases smaller than that of their male counterparts. The superior angle of the thyroid cartilage was found to be under 90° in males and over 90° in females. This finding held true with all age groups. Lastly, Hicks (1981a, b) concluded changes in the human voice over the span of decades are not attributable to changes in the hyoid bone or cartilage.

Mafee, Schild, Valvassori, and Capek (1983) verified the presence and general extent of carcinoma by using celloidin embedded specimens to complement the results of computed tomography. Seven specimens, cut only in the transverse plane, were cut down to the level appropriate for the computed tomography scan. Results indicated sectioning did indeed confirm the computed tomography findings. Mafee et al. (1983) concluded computed tomography scanning to be the best means of laryngeal integrity assessment available.

Silverman and Korobkin (1983) utilized computed tomography on normal larynges. The purpose was to scan the larynges in transaxial, coronal and sagittal planes to demonstrate disease-free laryngeal anatomy. These data were to serve as a basis of comparison for obscure anatomical anomalies induced by disease states.

Kahane and Kahn (1984) examined the intrinsic laryngeal musculature of infants. Particular emphasis was placed on weight, differences due to gender, and intermuscular interactions. Nine

infant larynges were collected. Seven of these subjects died as a result of sudden infant death syndrome. Five subjects were male and four were female. Muscles were dissected off, blotted, and weighed on a Mettler balance. Kahane and Kahn (1984) compared their data to that of adult data generated by Bowden and Scheure (1960). Kahane and Kahn (1984) concluded the weights of respective intrinsic muscles established in infancy, maintained their proportional relationships in adulthood as well. A consistent finding in both infant and adult larynges indicated the cricothyroid muscle to have the largest mean weight. Bowden and Scheure (1960) did not address differences due to gender in the weight of the adult intrinsic laryngeal musculatures. However Kahane and Kahn (1984) found no differences due to gender in their infant intrinsic laryngeal musculature. They further concluded intermuscular interactions or functions aimed at delineating vocal and nonvocal laryngeal behaviors would require additional research.

## Statement of Purpose

A review of the literature indicates there is little serial sectioning information available on disease-free larynges. The purpose of this study was to examine disease-free human larynges in block following serial dissection. The major thrust of the proposed study was to delineate specific soft tissue structures and how those structures appear different depending on the plane of dissection. Horizontal, coronal, and sagittal serial section planes were employed as a means to facilitate examination. Six adult male human larynges were dissected. Comparative measures were made primarily regarding

soft tissue. The proposed measurements required the soft tissue structures be revealed at different sequential levels for the purpose of viewing and comparing those structures in relation to one another as well as in relation to hard tissue. Further, this technique allows the course of particular soft tissue structure(s) to be illustrated. Serial sectioning best demonstrated the internal configuration of these structures. The relevance of this study's contribution to the field of speech pathology is such that these measurements are used to facilitate a greater understanding of laryngeal anatomy.

This study has been designed to address several questions. In order to answer these questions the following null hypotheses were tested:

(1) There are no significant inferences relative to laryngeal behavior or function which can be postulated based on the course of muscle fibers demonstrated by this technique.

This hypothesis leads to the question, is it possible to infer cartilaginous and soft tissue behavior based on the combined information of the chosen measurements and illustration?

(2) There is no significant differentiation of tissue in block when topically stained.

This hypothesis generates a two part question. To what extent is it possible to differentiate via a stain (a) soft tissue from cartilage and (b) soft tissue from other soft tissue?

(3) There are no significant demonstrations of accurate real life measurements of soft tissue structures of interest as a result of the combined block embedding technique and photography.

The question generated by this hypothesis reflects a comparison of techniques. Will the block technique including photography of the cut block surface demonstrate the capability of measurements of soft tissue structures?

(4) There are no significant changes in the structures of interest seen during progressive serial sectioning in one plane of one specimen in its entirety.

The question is as follows: is it possible to measure the dimensions of critical structures following the removal of each slice, by means of scaled photography of the remaining block, and to demonstrate change in those dimensions?

(5) There is no significant effect as a result of photographic and/or illustrative reconstruction of the identified soft tissue structures in a given specimen.

Is it possible to reconstruct a specimen by photographic and/or illustrative means?

# CHAPTER II
# METHODS

The purpose of this study was to determine the viability of obtaining measurement values of the intrinsic laryngeal musculature from a photographic slide of the remaining celloidin embedded block at given intervals following serial sectioning.

## Procedures

### Specimens

Adult male disease-free specimens were collected from autopsy in a 10% formalin solution. All specimens were caucasian and male. The age of the specimens ranged from 45 to 75 years of age, specifically 46, 48, 62, 68, 69, and 75, respectively. All organ donors expired due to causes other than that of any form of laryngeal pathology or compromise.

### Chemical Processing

Specimens were allowed to remain fixed in the formalin solution for 48 to 72 hours after which decalcification procedures were followed. The formalin solution was poured off and the specimen was rinsed three times in tap water before being placed in the decalcification solution.

Decalcification

Decalcification softens cartilage and bone and allows it to be cut. Since the specimens were adult larynges in which cartilages are usually calcified to some extent, decalcification was necessary. Fresh solution was used every other day. The old solution was poured off and fresh solution was poured on the specimen. This procedure generally continued for approximately 2 weeks. Specimens were x-rayed every fifth day to determine the extent of calcification remaining. At the end of decalcification, the specimen was rinsed in several changes of running tap water during a 24 hour period.

Dehydration

Based upon previous research on dehydration (Lillie & Fullmer, 1976; Humason, 1979), specimens were placed in a 70% ethyl alcohol solution which was changed twice during a 24 hour period. Immediately afterwards specimens were placed in an 80% solution.

Specimens remained in the 80% ethyl alcohol solution for 12 hours and then fresh 80% solution was poured on and remained on for the next 12 hours. Immediately afterwards specimens were placed in a 95% solution.

Specimens remained in the 95% ethyl alcohol solution for 12 hours and then were placed in fresh 95% solution for 12 subsequent hours. Immediately afterwards specimens were placed in a 100% solution.

Specimens remained in the 100% (absolute) ethyl alcohol solution, which was changed twice during a 24 hour period. Lastly, specimens were immediately placed in a solution consisting of half ether and

half absolute ethyl alcohol, referred to as ether alcohol, which was also changed twice during a 24 hour period.

Following dehydration, the celloidin processing was begun.

Block Preparation and Celloidin Embedding

The specimens selected for sagittal plane sectioning were split mid-sagittally and dissection proceeded in a medial to lateral progression, first on one side and then the other. Coronal specimens were cut in half along the anterior to posterior continuum and then set up into two separate blocks, an anterior and a posterior block. Each block was dissected from the central coronal plane of cut on out anteriorly and posteriorly, respectively. Finally, the two transverse specimens were cut into superior, medial and inferior blocks. One specimen had a center sagittal cut, the other did not. In one case rendering three blocks, superior, medial and inferior, that contained both right and left structures. In the other case, where the right and left halves were separated at the median sagittal plane, six blocks, superior, medial and inferior existed. In one case soft tissue measures resulted in bilateral representation within the same block. The other case or second transverse specimen resulted in unilateral representation of soft tissue structures. In the case of the six block transverse specimen, the medial blocks contained the designated structures of interest. The inferior and superior blocks consisted largely of cartilage and some fat. In all cases the large block cuts were made with the use of a brain knife or a band-saw.

Specimens were placed in a 5% celloidin solution and remained there for 2 weeks. Five percent celloidin solution consists of 150

grams of nitrocellulose dissolved in 3000 ml of ether alcohol. Specimens were then placed in a 10% celloidin solution and remained there for 2 weeks. Ten percent celloidin solution consists of 300 grams of nitrocellulose dissolved in 3000 ml of ether alcohol. Finally, specimens were placed in a 20% celloidin solution and remained there for 2 weeks. Twenty percent celloidin solution consists of 600 grams of nitrocellulose dissolved in 3000 ml of ether alcohol.

After the six weeks of celloidin processing the specimen was prepared for cutting or set up into a block. Essentially this was achieved by several steps. The side or surface of interest of the specimen was placed face down in the dish. A quantity sufficient to cover the specimen with 20% celloidin was poured into the dish. A piece of paper with the autopsy identification number was placed on the top surface of the specimen. In effect this top surface became adjacent to the microtome mount and, therefore, in reality was at the bottom of the mounted specimen block. The identification number was recorded in pencil, as inks wash out or run. Next, the lid was loosened and the specimen allowed to dry until it was the consistency of gelatin. Chloroform was poured over the specimen, sufficient to cover it, and left overnight. The dish was sealed tightly with tape. The next day the excess celloidin was cut off around the edges of the specimen. The specimen was put back in the dish, and fresh chloroform poured over it. The specimen remained like this for one hour. This step allowed the portion of the specimen, face down in the dish, to harden as a part of the block. The block appeared hazy,

after it was successfully hardened. If the celloidin had remained clear, then a celloidin strip would have been cut out of the dish. This strip would have existed at the lateral margins of the dish, virtually all the way around the dish. The specimen would have been covered in chloroform once again, the lid replaced, and left for one hour. The most significant step was to be sure to place the correct side face down in the dish. The correct side was the side or surface intended to be cut first. This side was the top of the block.

Once the specimen was hardened into the block, it was mounted on the microtome sledge plate. This was achieved as a result of several steps. The chloroform was poured off. The specimen was placed in a separate dish and covered with ether alcohol where it remained for 5 minutes. The sledge plate and 20% celloidin were ready for immediate use. A small amount of ether alcohol, was followed quickly by a small amount of 20% celloidin poured onto the sledge plate. These solutions established a mounting base for the specimen. The specimen block was immediately placed on the solution base and oriented in such a fashion that it was at an angle to the blade. The purpose was to ease the blade into the specimen block, thereby reducing the shock to the specimen. It was also important to note the composition of the structure encountered first by the blade to avoid bone where possible. Once the specimen was oriented on the solution base, the specimen was covered in 20% celloidin to seal the block onto the sledge. The specimen, sledge and all, was placed in chloroform for one hour. The specimen should not remain in the chloroform over one hour, as changes result in the block. The block was mounted on the

sliding microtome and dissection began. Specimens not slated for immediate dissection were hardened into a block and then stored in a 70% ethanol alcohol solution. Slices cut from a dissected block were placed on individual sheets of numbered bibulous paper and also stored in 70% ethanol alcohol solution. Storage may be maintained in this fashion for an indefinite period of time. Additional 70% ethanol alcohol solution should be periodically poured onto any stored material.

Dissection

Following the celloidin processing, each specimen was serially dissected. Some experimentation was necessary to determine the optimal slice thickness which was determined to be a 35 micron thickness. Each specimen was cut in its entirety in one plane. The newly exposed surface of the remaining block was stained and cleared in order to accentuate muscle, connective tissue and cartilage. Serial sectioning was documented by photographic means. Specimens were dissected in units of 5 to 10 microtome passes, 35 microns each on a sliding microtome. The first specimens to undergo serial sectioning were photographed after every tenth pass. Subsequent specimens were photographed in block following the fifth microtome pass. This alteration in dissection protocol was believed necessary to observe subtle structural changes. Tables available with this text (Appendices B-D) clearly demonstrate measures of the structures of interest did not occur with every photographic slide but rather were made as deemed necessary. Photographic documentation was used to record the progression through the larynx and change in intrinsic

musculature revealed in serial section. The stain ultimately selected was Van Gieson stain, and the clearing solution selected was 70% ethanol alcohol.

Van Gieson Stain

A saturated aqueous solution of picric acid consisted of 100 ml of distilled water and 2 grams of picric acid. While a 1% aqueous solution of acid fuchsin required 1 gram of acid fuchsin and 100 ml of distilled water. In order to yield Van Gieson stain, 5 ml of 1% aqueous solution of acid fuchsin was combined with 100 ml of picric acid. The Van Gieson stain was chosen because of the multitude of stains tested it best delineated the structures of interest. Muscle was expected to take on a yellow hue, while collagen was expected to be in the red/pink distribution (Humason, 1979; Luna, 1968).

## Measurement

Photographic Apparatus

A commercially available copy stand equipped with twin tungsten lights was mounted with an Olympus (OM2) 35 mm camera and a 90 mm Vivitar lens. The copy stand was stationed across from the sliding microtome. The preferred F stop was between 5.6 and 8, while the preferred shutter speed was 1/30 second. The film selected was Kodachrome 25 which produced faithful color representation and contained fine grain emulsion. To facilitate accurate measurement a 1/10 inch grid was present in each photographic slide, adjacent to the identification number assigned each particular slide. The slide identification number incorporated the age of the specimen, the roll

and number of the exposure on the film, as well as plane markers. The presence of L or R signals the sagittal plane and either the left or right side respectively. The presence of A or P signals the coronal plane and either the anterior or posterior aspect respectively, whereas the presence of I, M, S or IL, ML, SL signals the transverse plane and either inferior, medial, superior, or inferior left, medial left, or superior left aspect respectively.

Instrumentation

Serial sectioning was conducted through the use of a sliding microtome model number 1400 Leitz. The means of measurement was a graphics tablet referred to as the Versawriter Tablet, marketed by Versa Computing, Inc., of Newbury Park, CA. The versawriter was interfaced with an Apple IIe computer. A numerical value appears on the screen and was accurate to greater than 30/1000 inch. A line drawing of the structure of interest was displayed on the screen along with a numerical value. This value was directly proportional to the value identified utilizing the 1/10 inch grid for calibration. Area and perimeter values were also determined. In securing measures, the same procedure or manner in which the measure(s) were made, were consistently followed, except when not possible due to the limits of the size of the graphics tablet (8 inches x 12.5 inches). In some instances the orientation of the tablet had to be changed, as in measuring the height of the thyroid cartilage. Similarly, this reorientation was also necessary at times when measuring the distance between the apexes and prominences of the thyroid cartilages. Photographic images of the slides in serial section were projected one

at a time onto the surface of the tablet for measurement. A standard screen was cut and secured onto the tablet surface. The photographic images were projected from a Kodak Ektagraphic slide projector model AF-2 fitted with a Kodak Ektanar lens.

Structures to Be Measured

Soft tissue measurements were of three basic types: anterior to posterior, medial to lateral, and superior to inferior. These measurements were made when appropriate for a particular plane and applied to specific soft tissue structures. For instance coronal slices allowed for medial to lateral and superior to inferior measures (Tucker, 1971), whereas sagittal slices allowed for anterior to posterior and superior to inferior measures. And transverse slices allowed for anterior to posterior and medial to lateral measures. The structures of interest were measured as closely as could be determined by the delineated boundaries. These values represented apparent height, width, and depth as opposed to actual height, width, and depth. Each structure was followed as closely as possible. In the event that a structure curved, if it was necessary to follow the curve in order to get a more representative measure, the curve was followed. Some cartilaginous measures were included (Hicks, 1981b; Mane, 1971). Obviously not all structures appeared in all planes in all specimens.

## Shrinkage Study

In addition to the processing of the specimens as mentioned above, it was clear that the numerical values determined from the

information on the structures of interest would be altered from what their actual values were in life. These values were expected to be altered as a result of shrinkage due to the chemical processing. In order to have an idea of what that change was, another specimen separate from the six adult male specimens previously mentioned was taken fresh from autopsy prior to any fixation in formalin. This specimen was then processed as each of the other specimens and measured and weighed (when appropriate) through each phase of the chemical processing procedure.

# CHAPTER III
# RESULTS

The current study assessed the utility of the intact celloidin embedded specimen block as a photographed medium for generating representative measures of the intrinsic laryngeal musculature. Serial sectioning of the intact block was conducted in three planes of dissection, coronal, sagittal, and transverse.

## Some Aspects of Measurement

Structures were consistently measured throughout the progression into or out of the larynx as long as clear boundaries were identifiable. Absence of a measurement indicated the boundaries were either obscure or that the structure of interest ceased to exist in a given specimen. Utilization of the celloidin embedding, serial sectioning and topical block staining techniques did indeed make it possible to view and measure the structures of interest in relation to one another as well as in relation to cartilage. The course of a given intrinsic laryngeal muscle as well as transition in its size and shape distribution were revealed via serial sectioning. Changes in size were corroborated by the area, perimeter, anterior to posterior, medial to lateral and inferior to superior measures generated. These values were listed in the attached appendices. For further demonstration of structural change illustrations were included

representing each plane. The illustrations in conjunction with the tabular data clearly depict structural transition. The specimen which received the most extensive illustrative depiction, including both the anterior and posterior blocks, was specimen 3. Specific slides were chosen in the progression through this specimen to convey the effect of serial sectioning. Examination of additional illustrations addressing the sagittal (specimen 1) and transverse (specimen 2) planes displayed some of the same musculature. The plane of dissection dictated the visual depiction of each muscle. A specific muscle in one plane was not always easily recognized in another plane.

Originally it was intended that as many soft tissue structures as possible would be measured. Among the intended was the quadrangular membrane. This structure was never observed. It was also intended that muscles known to have separate bundles would be identified by those bundles. However, since it was not possible to consistently identify both bundles throughout dissection, the structure was referred to by the primary muscle name. For instance pars oblique and pars recta were referred to as cricothyroid. This same format with few exceptions was followed for the thyroarytenoid and interarytenoideus muscles. Also the vibratory mass was measured only on coronal specimens. The mass perimeter was defined as extending from the medial border of the thyroarytenoid muscle including the mucosa, measuring laterally to the thyroid cartilage, proceeding inferiorly to the level of the superior border of the cricoid cartilage, and finally proceeding in a superior-medial progression consistent with the lower border of the thyroarytenoid muscle.

Measurement to the level of the superior border of the cricoid cartilage was as stated unless there was an obvious muscle boundary just lateral and inferior to the apex of the cricoid cartilage. This concept was considered useful since it was considered that more than the thyroarytenoid musculature vibrated during sound production. Hence, these measures were taken in an attempt to quantify the approximate size of such a mass in healthy adult male specimens. It was of course impossible to state the exact size of such a mass, as well as to account for individual variation.

The phonatory position was simply a measure of the glottal width divided in half. In theory each healthy vocal fold did approximate to midline. The phonatory position therefore represented the distance each fold moved medially in order to approximate at midline. In essence this measure quantified the cadaveric position of the vocal folds and from that point estimated the distance of medial movement necessary for sound to be generated. It was also necessary to keep in mind that this potential displacement was merely an approximate value since the tissue had been altered due to chemical processing, and shrinkage.

Measures for all structures were generally secured by moving the tracing point in a superior to inferior, medial to lateral and/or anterior to posterior direction. Care was taken to proceed slowly to allow the Apple IIe computer to keep pace with the Versawriter Graphics tablet. Consistency in speed or rate of movement of the tablet arm as well as consistent sensitivity to pressure were maintained. Periodic reliability checks were made in an effort to

monitor speed and sensitivity. Calibration of the Versawriter tablet with the measurement grid incorporated in each slide occurred at the beginning of each session. If any movement of the projector occurred, the program was restarted and recalibrated. In certain planes, due to the nature of dissection in that plane, certain structures were not observed. They were, however, identified and measured in a different plane. This was especially true in the case of ligaments. In all specimens cartilage was easily distinguished from soft tissue musculature and ligaments. In most cases fiber tracts were followed via Kodak 35 mm slide projection without much difficulty. The same slides, made into prints, showed far less differentiation. Each slide carried with it the photographic 1/2-inch grid equivalent to 12.7 mm as well as a slide number. Once again, the slide number was composed of the age of the specimen, the number of the roll of film thus far used on that specimen block, and the number of slices which had been cut into that block.

The data generated by this study established the normative data base of intrinsic laryngeal musculature in adult male disease-free specimens. This was a small sample and meant to serve as a data base with that limitation in mind. These data yield the area, perimeter, and essentially height, width, and depth values of intrinsic laryngeal musculature in six adult male specimens.

## Shrinkage Study

A specimen from a 45 year old, disease-free, adult male was taken fresh from autopsy and subjected to each of the chemical processing

stages the other specimens had been subjected to prior to serial sectioning. The rationale was to determine the amount of shrinkage introduced via chemical processing. This was of significant interest since no such data could be found concerning the larynx and none particularly concerning the intrinsic musculature of the larynx.

The initial weight of the specimen was 107.7 grams. The specimen was then cut sagittally, rendering the right half to be used, weighing 57.4 grams. Polypropylene sutures were sewn in two places, constructing a backwards "L" configuration. A triangular shape could actually be discerned. A set of Riefler calipers were used to measure the sides of the triangle. Volume displacement conducted in a 70% ethyl alcohol solution yielded 43 ml; while the values of the distance between sutures were 1.0 mm inferior suture, .7 mm lateral suture, and 1.4 mm hypotenuse.

The specimen was then placed in a formalin solution for 48 hours and then measured. Weight was 62 grams; the inferior suture was .9 mm; the lateral suture was .6 mm; the hypotenuse was 1.3 mm; volume displacement was 41 ml. The specimen was then decalcified and x-rayed. The specimen remained in the decalcification solution with appropriate changes to fresh solution for 11 days. Weight was then 52.4 grams; inferior suture was .9 mm; lateral suture was .6 mm; the hypotenuse 1.3 mm; volume displacement was 37 ml.

The specimen was placed in running tap water for 1 day to remove any acid from the decalcification solution. Weight was 50.5 grams; inferior suture was .9 mm; lateral suture was .6 mm; the hypotenuse was 1.3 mm; volume displacement was 41 ml.

The specimen was placed in 70% ethyl alcohol solution which was changed twice during the course of the day. At the end of that 24 hour period the weight was 50.2 grams; inferior suture was .9 mm; lateral suture was .6 mm; the hypotenuse was 1.3 mm; volume displacement was 39 ml.

At the end of the dehydration phase the specimen was placed in an ethyl ether or ether alcohol solution which was changed twice in a 24 hour period. Weight was 38.5 grams; inferior suture was .9 mm; lateral suture was .6 mm; the hypotenuse was 1.2 mm; volume displacement was 35 ml. At this point, overall shrinkage for the inferior suture segment was 10%; for the lateral suture segment, 14%; and for the hypotenuse segment, 14%. Total overall shrinkage due to chemical processing was 18% by volume and 21% by weight.

## Hypotheses: Empirical Reply

The first hypothesis was concerned with postulated laryngeal behavior based on muscle fiber course revealed via serial sectioning. More particularly, was it possible to infer cartilaginous and soft tissue behavior based on the combined information of the measurements and illustrations? It was possible to infer behavior and in fact vibratory behavior was inferred for the vibratory mass (Hirano et al., 1983). The mass encompassed tissue well beyond the thyroarytenoid musculature proper as delineated in the coronal specimens. This conjecture was based on the muscle fiber tracts observed in the described musculature. However, behavior of the laryngeal cartilage was not inferred, nor was behavior of any soft

tissue intrinsic structure. Although it was possible to observe and trace intrinsic fiber tracts in most cases, it was not possible to infer unique locations and behavior beyond the course and functions already attributed to individual muscles by recognized anatomists (Bailey & Biller, 1985; Gray, 1985; Hollinshead, 1974; McMinn et al., 1981; Paff, 1973; Pernkopf, 1963-64; Sobotta & Uhlenhuth, 1957; Zemlin, 1981).

The second hypothesis addressed differentiation of tissue utilizing the block embedding and staining techniques. Particular attention was given to the delineation of soft tissue from cartilage and soft tissue from other soft tissue as a result of staining. The Van Gieson stain did easily differentiate soft tissue or intrinsic musculature from cartilage. However, although the Van Gieson stain was the stain of choice following many trial stains and clearing procedures, it failed to easily differentiate muscle tissue fiber tracts in all cases. Fiber tracts were generally discernible, but not always. Overstaining obscured the course of various tracts. And although it was not reasonable to expect a stain to selectively and differentially stain the same type of tissue, in this case the composition of muscle tissue, still the ability to follow certain fiber tracts was anticipated. Some color change was evident across and within specimens. The Van Gieson stain was expected to turn muscle tissue yellow and collagen tissue hues of red and pink. These color parameters probably would have been consistent and blatantly obvious had the medium been paraffin. Some deviation from this color pattern was anticipated since the clarity of the medium of choice was

celloidin rather than paraffin. Celloidin had demonstrated clearer visualization of tissue in the slice than did paraffin. That is to say for histologic preparation of microscopic slides celloidin was preferred over paraffin. When left in block, the specimen was viewed through the block and in that way the structures soon to be encountered in the dissection were seen well before they were at the surface of the block. The intensity of the Van Gieson stain in some instances tended to obscure the visibility of the individual fiber tracts. It was believed that this obscurity was in part due to the nature of the thickness of the block rather than due to the medium being celloidin. It is likely that some irregularities in staining were the result of the specimen being stained in block rather than by the slice. The traditional means of preparation involves a slice, perhaps 10-15 microns thick, stained via hematoxylin and eosin and then mounted on a microscopic slide. Hematoxylin and eosin are better stains for histologic observation. Although the current study was not a histologic study, the stain choice was more for macroscopic purposes. Microtome slices for the current study were 35 microns thick and the remaining stained block was much thicker. Still it is likely that some of the staining irregularities were due to the block itself. Each time slices were removed and the block surface stained and cleared, the surface of the block was changed. In some instances penetration deep into the block via the clearing medium can result in staining irregularities. This was not the problem in this case since the clearing agent was not allowed to remain on the block surface sufficiently long enough to penetrate deep into the medium and cause

undesired change layers below. If that had been the case the undesired change would have been compounded by each additional staining and clearing. However, it is likely that the staining irregularities were the result of surface changes in the block, as well as constraints of stain absorption time, and finally the thickness of the block. Another possible contributory factor was the method of application of the stain. Initially the stain was applied via a cotton tipped applicator which resulted in some remnants of cotton on the surface of the block. The cotton tipped applicator was then abandoned and a suctioned dropper used. Again, certain problems appear to have resulted from the block itself. The block was preferred intact to demonstrate the internal configuration of the intrinsic musculature in relation to one another. The presumption was made that the configuration would represent actual relationships if the laryngeal structures was allowed to remain intact in the celloidin block. Hence, for structural intactness, some sacrifice resulted in less clearly defined fiber tracts.

The third hypothesis concerned demonstration of accurate life measurements of soft tissue structures of interest related to the block embedding technique. Specifically, was the block technique preferable to the histologic slice technique for purposes of more accurate depiction and therefore more accurate measurement, i.e., closely associated with in vivo specimens? One advantage of the block technique was the maintenance of the specimens' original shape. Furthermore, the intrinsic musculature remaining following dissection was allowed to retain its shape and configuration. There was no

evident shearing, tearing, or stretching of the block resulting in alteration of laryngeal tissue. However, to obtain an approximation of accurate real life measurements, in as much as is possible, a shrinkage study was conducted to determine the amount of shrinkage of laryngeal muscular tissue due to chemical processing. The overall shrinkage was determined to be 18% by volume and 21% by weight. The measurement values taken together with the shrinkage data yield a more accurate representation of structure size and configuration than would have been possible by just the measurements alone.

The fourth hypothesis addressed the possibility of observing existing change in the structures of interest during progressive serial sectioning in a given specimen. A specimen sectioned in one plane throughout its entirety, can easily be examined for structural transition. The actual question generated considered the ability to measure the dimensions of critical structures, subsequent to the removal of each slice, by viewing the remaining block. A second question generated by this hypothesis concerned the ability to demonstrate change in the dimensions of those critical structures. As a consequence of examination of the attached tabular data, it is evident that it was possible to measure the critical structures in block subsequent to serial sectioning and to demonstrate a definite change in the dimensions of those structures.

The fifth and final hypothesis was concerned with a photographic and/or illustrative reconstruction of the identified soft tissue structures. The question generated addressed the reconstruction of a specimen and the quality of that reconstruction through the use of

photographic and/or illustrative means. It was possible to reconstruct the specimen through either means. This study generated a total of 792 slides, only some of which were selected for measurement and illustration. There was sufficient material available for reconstruction via photographic slides. The illustrations were drawn from the slides, tracings of those slides, and when available photographic prints. The illustrations were chosen due to the clarity of their reproduction.

## Tabular Data

The first set of tables is found in Appendix B. Data presented there are organized according to slide. In other words, slides are presented in the order in which they were photographed during the serial sectioning. All intrinsic laryngeal musculature of interest and cartilage, largely identified as landmarks, appearing in each consecutive slide were identified and measured. Specimen 1 was dissected via the sagittal plane and presented with both left and right sides. These sides were each infiltrated with celloidin and became celloidin blocks. Sectioning began with the most medial aspect of each block. The first slide appearing in this set of tables is 75-F1-5L. This was the fifth photographic slide on the first roll of film. There were five microtome passes at 35 microns each between each photographic slide. We were, therefore, 25 passes into the left sagittal block of specimen 1 when this photographic slide was taken. The only structure of interest appearing in this slide and, therefore, at the surface of the block was the interarytenoideus muscle. This

structure was measured on the graphics tablet which resulted in area, perimeter, inferior-superior distance, and anterior-posterior distance measures. The next slide listed in this set of tables is 75-F1-9L, which contained measurement values for the posterior cricoarytenoid muscle and the interarytenoideus muscle. This identification and measurement of structures of interest continued all the way through the block. The result was a roster of the structures of interest and their measurement values as they appeared in the specimen organized by slide. Upon examination of Table B-2 the same information was made available for the right block of sagittal specimen 1. A progression through the B set of tables, B-3, presents information on the superior block of specimen 2. Specimen 2 was dissected in the transverse plane, resulting in the measurement parameters to be slightly different. Area, perimeter, and anterior-posterior distance were still categories; however, medial-lateral distance was a new parameter. These parameters were valid for any transverse specimen, and in this case applicable for both the superior and medial blocks. The superior block was dissected from its inferior surface on up through the epiglottis or the top of the superior block. The medial block was dissected from its superior surface on down through the base of the cricoid ring. Specimen 3 was a coronal specimen, which resulted in both an anterior and a posterior block. Dissection began at the medial aspect for both blocks. The parameters of measurement dictated by the coronal plane of dissection include area, perimeter, inferior-superior distance, and also medial-lateral distance. Every plane of dissection dictated essentially two directional parameters

while one directional parameter was totally void by definition of that particular plane of dissection. This void in directional parameters was thought of as the missing dimension. Some advantage did occur as the result of serial sectioning by plane. Structures were seen in their appropriate relation to other structures while their configurations remained intact. The usage of different planes allowed the same structure(s) to be viewed from different perspectives. The tabular listings indicated that measures were not made on every slide. Slides were chosen based on change evidenced in the structures measured in the preceding slide as compared to how the same structures appeared in the current slide and for clarity of boundaries. Essentially Appendix B allows the identification and measurement of structures on the surface of the remaining block. At any point in the progression through the larynx, the appearance and/or disappearance of structures of interest were known. It was as if one was examining the surface of the remaining block and possessed the ability to proceed or recede through the dissection.

The second set of tables is given in Appendix C. This set is organized by the structure of interest. The first table again addresses the left block of specimen 1, which was dissected in the sagittal plane. The structure identified initially was that of the cricothyroid muscle. Two slides are listed, 75-F2-14L and 75-F3-1L, as containing the cricothyroid muscle in the left block of specimen 1. Measurement values are given for the area, perimeter, inferior-superior, and anterior-posterior distance of the cricothyroid muscle as it appeared in those two slides. The next structure of interest

listed was the interarytenoideus muscle. Five different slides are listed as containing the interarytenoideus muscle and appropriate measurement values are given for each. This procedure is followed with each of the structures of interest all the way through the left block of specimen 1. Table C-2 presents the same information, that is, identification and measurement of the structures of interest organized by structure for the entire right block of specimen 1.

Table C-3 lists information organized by the structure of interest on the superior block of specimen 2. Specimen 2 was a transverse specimen and by virtue of definition of this plane of dissection slightly different information is given. Measurement values were generated for area, perimeter, anterior-posterior, and lateral-medial distance.

Table C-5 addresses the anterior block of the coronally dissected specimen 3. Measurement parameters include area, perimeter, inferior-superior distance, and medial-lateral distance. Again, since this is the C set of tables, information is organized by the structures of interest.

Finally, Appendix D or the D set of tables is organized in a slightly different fashion. As was indicated earlier, by definition of a particular plane, a specific parameter of directional information was absent. Specimens 1 and 4 were sagittal dissection specimens. By virtue of the sagittal dissection plane no information was given on the medial-lateral appearance of structures of interest. For transverse dissection specimens, specimens 2 and 5, no information was given on the inferior-superior distance of appearance of structures of

interest. Specimens subject to the coronal plane of dissection included specimens 3 and 6. This plane of dissection did not display anterior-posterior distance on structures of interest. Appendix D presents a summation of the missing dimension for each plane of dissection for each specimen. This information was the result of tabulation of the number of slides in which the structures of interest appeared in, multiplied by the number of microtome passes occurring between photographic slides, and multiplied again by the unit of slice thickness of 35 microns. This value was then converted from microns to millimeters. The number of microtome passes between slides varied with the specimen.

## Apparent Size of Structures Arranged by Slide

Examination of the available data was that the course of each particular muscle was visible. Some structures were easily identifiable in all planes and in all blocks, while others were barely discernible.

Specimen 1 (Table B-1) demonstrated a definite core of consistent intrinsic musculature. It also manifested the infrequent appearance of ligaments, such as the posterior cricoarytenoid ligament and the anterior cricoarytenoid ligament, as well as the singular entry of the conus elasticus. Slide by slide, a sequential progression, medial to lateral, existed through each block of this specimen. Measurement values were given for the structures of interest. These values allowed the comparison of structures of interest within a given level of the remaining block. Size differences were noted and alteration in

size from slide to slide for the same and different structures were also noted. Due to the nature of the consistency of the core a continuity of pattern was predictable. There was an anticipation of the appearance of structures thought of as comprising the core of intrinsic musculature via the sagittal plane.

Specimen 2 (Table B-3) had a slightly different core than did specimen 1. The consistency of this core depended on how far up or down into the block dissection had occurred.

Specimen 3 (Table B-5) generated the most data. These measures are perhaps due to nearly simultaneous bilateral representation. The core of the initial slide in both the anterior and posterior blocks was the same. This representation of muscles was expected since the first slide in each block represents the two medial surfaces that were in contact prior to embedding. And although the agreement in muscular represertation was anticipated, it was not exactly true for specimen 6 (Table B-11) which was the second coronally dissected specimen. The vibratory mass and its associated measurements existed nearly throughout the entire specimen, that is in both blocks. A coronally dissected specimen was perhaps the easiest in which to view the structures of interest in continuity. Due to the bilateral representation there was generally a symmetrical comparison.

Specimen 4 (Table B-7), although a sagittal dissection specimen, presented somewhat differently than did specimen 1. A likely reason for this difference was the number of microtome passes between photographic slides was twice the number in specimen 4 than those occurring in specimen 1. This difference was a factor in all the same

plane dissection comparisons. Also another possible factor in this particular case was the initial size of the specimen itself. The outward appearance of a specimen may be deceiving, perhaps due to the presence of extensive extrinsic laryngeal musculature.

Specimen 5 (Table B-9), another transverse specimen, was set up into six different celloidin blocks. Due to the number of blocks in specimen 2, it was possible to examine for bilateral representation of musculature. Specimen 5 lacked bilateral representation as a result of a center cut and each side cut into thirds. Sectioning revealed the structures of interest were located in the medial blocks. There was certainly some structural asymmetry present as was clear in the case of the lateral cricoarytenoid muscle. This structure appeared at different levels slices apart on the two sides. In part this difference was due to asymmetry. However it is quite likely that the structure was present earlier on the right side but with dubious boundaries. A center cut for transverse specimens is not recommended for future dissections.

Specimen 6 (Table B-11), a coronal dissection, closely resembled the anterior block of specimen 3 in terms of appearance of structures of interest. However the posterior block was somewhat atypical. It was not possible to measure the distance from the cricoid cartilage to the true vocal fold. It was equally impossible to assess any glottal aperture or phonatory position. Again, the number of microtome passes differed on these two coronal specimens. However, it is unlikely that this factor alone could account for the absence of the glottal aperture and true vocal folds in the posterior block. Perhaps the

band-saw cut was further posterior on this specimen than it was on specimen 3. This factor could possibly explain the presence of these structures in the anterior block alone.

The impact of examination of these tables is such that some differences and similarities across specimens should be clear. The entire set of tables in Appendix B or the listing of structures by slide was the most appropriate for targeting the structures of interest in relation to one another leaving the internal configuration intact. Further the concept of a system working together is conveyed.

Apparent Size of Structures Arranged by Structure Across Slides

Appendix C is the most appropriate set of tables for targeting the specific structures of interest individually, as they appeared in the slides. Information available herein best indicates change within a structure. Change was determined by examination of the numerical extremes in the area measure of a given structure. If an area measure was not given, then the most and least values of the directional parameter given were used. Change within a structure was significant as it addressed the participation, size, or extent of involvement of a structure. This information further contributed to the normative data available for each specimen.

The left block of specimen 1 (Table C-1) indicated the structure exhibiting the most change in size was that of the thyroarytenoid muscle, while the least change was exhibited by the lateral cricoarytenoid muscle and the cricothyroid ligament. The right block of specimen 1 demonstrated the most change in size in the anterior

cricoarytenoid ligament, while the structure with the least change was the lateral cricoarytenoid muscle.

Specimen 2 (Table C-3), a transverse dissection, indicated some of the same musculature. The most transition or size change within the superior block occurred in the thyroarytenoid muscle, while the least transition occurred in the posterior cricoarytenoid ligament. The medial block of the same specimen indicated the most transition in the cricothyroid muscle and the least transition in the thyroarytenoid muscle.

Specimen 3 (Table C-5) was a coronal dissection and was divided into anterior and posterior blocks. Dissection yielded different information in these blocks. The most extensive transition occurred in the thyroarytenoid muscle and the least size transition in the lateral cricoarytenoid muscle. The posterior block of the same specimen again indicated the thyroarytenoid muscle as the structure which demonstrated the most transition, and the lateral cricoarytenoid muscle, the least transition.

Specimen 4 (Table C-7) was a sagittal specimen split into two blocks, left and right respectively. The left block presented the most extensive structural transition in the thyroarytenoid muscle and the least transition in the anterior cricothyroid ligament. The distribution of intrinsic musculature in the right block was somewhat different. The most extensive structural transition occurred in the cricothyroid muscle and the least in the interarytenoideus.

Specimen 5 (Table C-9) was the second of two transverse specimens. This specimen was divided into six small blocks and then

dissected in serial section. It was determined that the medial block, bilaterally, contained the structures pertinent to the purposes of this study. The most transition in size distribution in the left block implicated two muscles, the posterior cricoarytenoid and the thyroarytenoid muscles. The least change was indicated in the lateral cricoarytenoid muscle. Further the thyroarytenoid muscle represented the most change in the right medial block, while the lateral cricoarytenoid muscle demonstrated the least change.

The last specimen addressed in the terms of structural transition was the sixth specimen (Table C-11). This was the second coronally dissected specimen presenting with both an anterior and a posterior block. The greatest size transition, in soft tissue of the anterior block, occurred in the area of the vibratory mass. However, the single soft tissue structure which demonstrated the most transition was the conus elasticus. The least transition was revealed in the cricothyroid muscle. Measurement values in the posterior block demonstrated, assessment of one aspect of the vibratory mass, the thyroarytenoid muscle to thyroid cartilage, manifested the most transition. The single structure demonstrating the most change was the thyroarytenoid muscle. And lastly, the lateral cricoarytenoid muscle displayed the least transition in a given soft tissue structure.

Summation: The Missing Dimension Due to Dissection Plane

The last set of tables (Appendix D) is most appropriate for quantification of the extent of the missing dimension. This

previously unavailable directional parameter was assessed by summation across the number of slides in which a structure was identified. The information herein presented differs from the soft tissue measures evidencing the most and least transition within a block as presented in Appendix C. The current data set was not numerically derived from a most to least site transition in a structure. Rather, Appendix D addresses the continued presence, range, or extension of a structure. The summation, or Appendix D set of tables, of the previously intangible dimension indicated in specimen 1 (Table D-1) was the medial to lateral dimension. The most extensive soft tissue structure in specimen 1 was the thyroarytenoid muscle. The least extensive range involved two structures, the lateral cricoarytenoid muscle and the conus elasticus. The right block of specimen 1 (Table D-2) demonstrated the soft tissue structure of greatest range was the thyroarytenoid muscle. The structure with the least range was the posterior cricoarytenoid ligament.

The superior block of transverse specimen 2 (Table D-3) indicated the thyroarytenoid and the posterior cricoarytenoid ligament as structures with the greatest and least musculature range respectively. This was determined by a summation of inferior to superior dimension. The medial block in this transverse specimen (Table D-4) indicated two soft tissue structures of equivalent range. They were the lateral cricoarytenoid muscle and the posterior cricoarytenoid muscle. The structure of the least range proved to be the thyroarytenoid muscle.

Specimen 3, a coronal dissection, was divided into anterior and posterior blocks. The previously intangible dimension of specimen 3 entailed a depth measurement as the unknown directional parameter, or the anterior to posterior distance. The anterior block (Table D-5) revealed the soft tissue structure of greatest range again represented two equivalent range structures. Those structures were the thyroarytenoid and cricoarytenoid muscles. Also the surface of the true vocal fold demonstrated the same numerical value. However, the vibratory mass, which extended beyond the limits of a single muscle was even more extensive. The least range values of two structures were of equivalent standing. Those structures were the thyromuscularis and thyrovocalis bundles of the thyroarytenoid muscle.

The posterior block of specimen 3 (Table D-6) presented the structure of greatest range as the cricothyroid muscle. Whereas the structure of least range concerned a portion of the vibratory mass. The portion referenced was the existing distance from the cricoid cartilage to the true vocal fold. The surface of the cord itself entailed a minute distance, but the intrinsic laryngeal muscle which exhibited the least range was the lateral cricoarytenoid muscle.

Specimen 4 was set up into two blocks, left and right respectively. This specimen was dissected in the sagittal plane from the medial aspect, outward to the most lateral aspect of the specimen. The missing dimension was determined by the summation of the medial to lateral dimension. The soft tissue structure in the left block (Table D-7) of greatest range was the cricothyroid muscle. The least range value implicated the posterior cricoarytenoid

muscle and the lateral cricoarytenoid muscle. The right block of the same specimen (Table D-8) evidenced the greatest distance by the thyroarytenoid muscle and the least distance shared equally between the lateral cricoarytenoid and the interarytenoideus muscles.

The second and last transverse specimen was specimen 5. It was dissected in six blocks, two of which contained relevant information for the current soft tissue study. The intangible dimension in a transverse specimen again was the inferior to superior dimension. The left medial block (Table D-9) demonstrated the most and least range in the posterior cricoarytenoid and the interarytenoideus muscles respectively. The right medial block of the same specimen (Table D-10) indicated the most extensive range involved the posterior cricoarytenoid muscle and the least extensive, the lateral cricoarytenoid muscle.

The sixth and final specimen was comprised of two blocks, anterior and posterior dissected in the coronal plane (Table D-11). The missing dimension of a coronal dissection once again was the anterior to posterior distance. This distance was conspicuously occupied by the thyroarytenoid muscle. However both the area of the vibratory mass and the distance between the thyroarytenoid muscle and the thyroid cartilage demonstrated greater values as did the surface of the true vocal folds. All of these were equivalent measures. The single intrinsic muscle which demonstrated the least presence was the cricothyroid muscle. However another soft tissue structure, the conus elasticus, was even less apparent. The last block of specimen 6 (Table D-12) was the posterior block. The structure of greatest range

occurring in this block was the cricothyroid muscle and the structure of least range was the lateral cricoarytenoid muscle.

The structures identified here as most and least prevalent were determined by quantifiable range extension. Some of the structures indicated were also indicated as significant in other data sets. In summary, the multivariate dissection technique used in this study allowed a multivariate approach to assessment. The assessment confirmed the importance of many of the same intrinsic laryngeal musculature structures throughout the larynx regardless of the assessment parameter.

## CHAPTER IV
## DISCUSSION AND CONCLUSIONS

The current investigation determined the plausibility of generating measurements from a 35 mm slide of the intact celloidin embedded laryngeal block while leaving the component laryngeal structures in their proper configurational relationships to one another.

### Interpretation of Results with Graphic Illustrations

Illustrations of specimen 3 graphically demonstrate the intrinsic musculature of interest. Alteration in size, configuration, and intermuscular relation are depicted. Specimen 3 was selected for illustration since it was the better of two specimens subjected to coronal plane dissection. This dissection approach generally yielded bilateral muscular representation. Additional illustrations were included for contrastive purposes of sagittal dissection specimen 1 and transverse dissection specimen 2. The slides measured and illustrations chosen were not always paired. Slides were chosen for measurement by an interval of roughly every fourth or fifth consecutive slide. The selection also depended on the clarity of the intrinsic structures of interest due to boundary definition, staining, and block glare or block thickness. Slides selected for illustration were selected on their ability to visually demonstrate change and the

appearance or disappearance of structure(s). The purpose of the selection dictated the terms of the choice. Figures 1 through 10 are depictions of specimen 3. Figure 1 (46-F1-11A) represents the 11th photographic slide on film one in the anterior block. Specific structures were identified as present in the remaining block. Those structures included the left cricothyroid muscle, thyroarytenoid muscles, conus elasticus, surface of the true vocal fold, cricoid and thyroid cartilage and vibratory mass. In the event of unclear boundaries, structures although identifiable as present, were not measured. This particular figure is also listed in the tabular data, Appendices B, C and D. Tabular listing was not always the case as not all illustrated slides were measured.

Figure 2 (46-F1-17A) represents the 17th photographic slide on film one in the anterior block. Specific structures identified included the left cricothyroid muscle, thyroarytenoid muscles, conus elasticus, cricoid and thyroid cartilages, and ventricle of Morgagni. This specific slide was not chosen for measurement. However surrounding slides (46-F1-14A; 46-F2-1A) were chosen and support the identification of the same structures as depicted in this illustration. Area and perimeter values for the left cricothyroid and thyroarytenoid muscles, directional parameter measures for the conus elasticus and the surface width of the true vocal fold, all thyroid cartilage and phonatory position measures increased from Figure 1 to slide 46-F1-14A; however, the medial aspect of the thyroarytenoid muscle to the thyroid cartilage and the area of the vibratory mass measures both decreased. Examination of slide 46-F2-1A indicated most

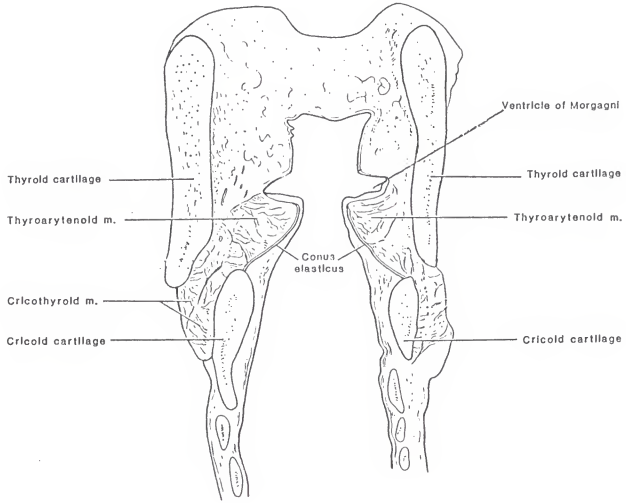


Figure 1. Slide 46-F1-11A/Specimen 3/Coronal Plane/Anterior Block.

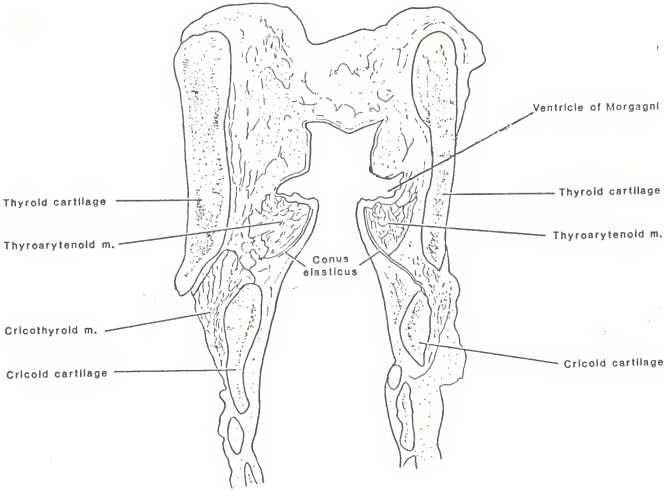


Figure 2. Slide 46-F1-17A/Specimen 3/Coronal Plane/Anterior Block.

soft tissue measures declined with the exception of the left conus elasticus, the area of the right vibratory mass, and the height from the cricoid cartilage to the true vocal folds which increased bilaterally. The distance between the thyroid cartilage apexes and inferior prominences both declined. Phonatory position also declined. Visual inspection of Figures 1 and 2 do not reveal much difference between the two illustrations.

Figure 3 (46-F2-4A) represents the fourth photographic slide on film two in the anterior block. Specific structures identified included the left cricothyroid muscle, left lateral cricoarytenoid muscle, thyroarytenoid muscles, conus elasticus, thyroid and cricoid cartilages and the ventricle of Morgagni. Comparison of the area and perimeter measures when given, and the directional parameter for those structures lacking an area measure indicated the alteration in the soft tissue structures from 46-F2-4A to 46-F2-6A as listed: a decrease in the lateral cricoarytenoid, cricothyroid, and thyroarytenoid muscles, as well as a decrease in area of the medial aspect of the thyroarytenoid muscle to the thyroid cartilage. The vibratory mass area had decreased on the right and increased on the left. Whereas the distance of the conus elasticus, surface width of the true vocal fold, height from the cricoid cartilage to the true vocal fold increased. Thyroid cartilage measures decreased with the exception of the height of the left cartilage. Phonatory position also decreased. Visual depiction indicated a change in shape or configuration evident in the thyroarytenoid muscle and the left cricothyroid muscle.

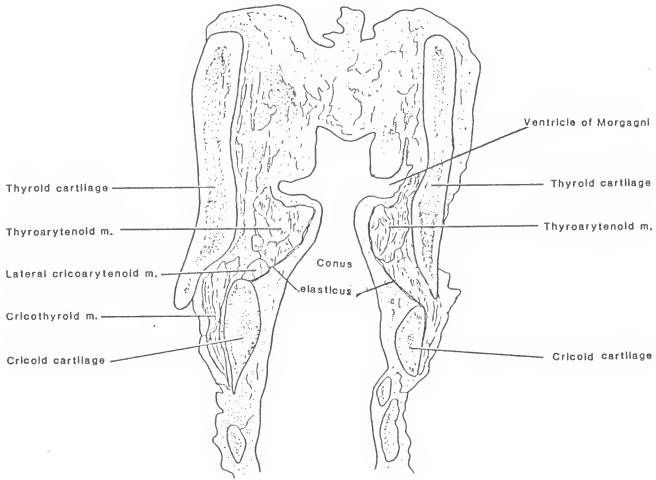


Figure 3. Slide 46-F2-4A/Specimen 3/Coronal Plane/Anterior Block.

Figure 4 (46-F2-12A) represents the 12th photographic slide on film two in the anterior block. Specific structures identified included the left cricothyroid muscle, thyroarytenoid muscles, the left lateral cricoarytenoid muscle, conus elasticus, cricoid and thyroid cartilages as well as the ventricle of Morgagni. This specific slide was not chosen for measurement. However, surrounding slides (46-F2-6A; 46-F2-13A) were chosen and support the identification of the same structures as depicted in this illustration. These slides were 35 microtome passes apart at 35 microns each. Intrinsic musculature area and perimeter or directional parameter transition indicated a decrease in the left lateral cricoarytenoid and thyroarytenoid muscles and a decrease in the conus elasticus in both thyroid apexes and prominences, similarly there was a decrease in height, and a decrement in the medial aspect of the thyroarytenoid to the thyroid cartilage. However the cricothyroid muscle and the height value from the cricoid cartilage to the true vocal fold indicated an increase. In some instances the increased or decreased values were not altered much from the previous value as measurements were extended four decimal places. Measurement of the area or directional parameter of the vibratory mass, phonatory position and surface width of the true vocal fold were not made due to lack of boundary clarity. The tabular data indicate change; however, the visual depiction of Figures 3 and 4 demonstrate a marked transition in the overall appearance and configuration of Figure 4. From this point through Figures 5 and 6 marked visual configurational transition again occurred.

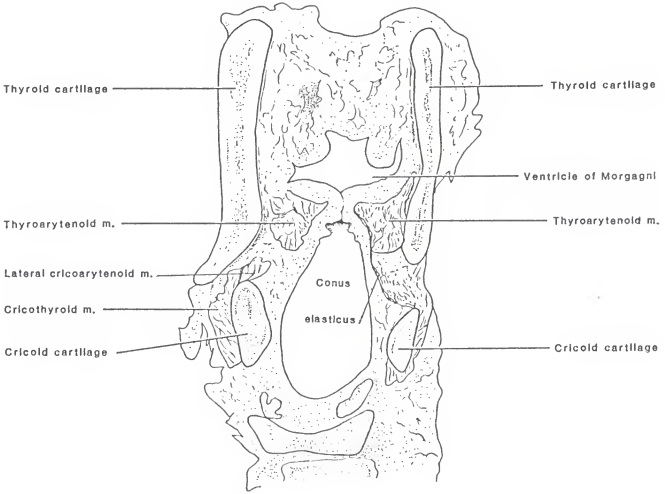


Figure 4. Slide 46-F2-12A/Specimen 3/Coronal Plane/Anterior Block.

Figure 5 (46-F3-2A) represents the second photographic slide on film three in the anterior block. Specific structures were identified. The thyroartyenoid muscle became meshed together near midline. Slides preceding 46-F3-2A presented the thyroarytenoid muscle as two separate bilaterally distributed muscles. The first slide listed in the tabular data which followed (46-F3-2A) was 46-F3-5A. Fiber tract discernment in this case allowed the identification of discrete bundles of the thyroarytenoid muscle. However when the bundle fiber tracts were not easily discerned the major muscle label, thyroarytenoid, was again used. Another bilaterally identified structure was the cricothyroid muscle. However the conus elasticus at this point had ceased to exist. Measurement from slides 46-F2-13A, the slide closest to Figure 4, and 46-F3-5A were examined in order to address transition in Figure 5. The lateral cricoarytenoid muscle ceased to exist, whereas the right cricothyroid muscle became clearly measurable. Both bundles of the thyroarytenoid muscle, thyromuscularis and thyrovocalis, were demarcated in 46-F3-5A. Clarity of the discrete muscular bundle fiber tracts or the thyroarytenoid muscle only occurred once throughout dissection and that was at this interval. The boundary of the thyroarytenoid muscle and the mucosal layer which surrounds it superiorly and medially was once again obvious. This in turn made possible the resumed measurement of the surface of the true vocal fold, phonatory position and the area of the vibratory mass. Since these were resumed measures, they were not present in 46-F2-13A. However values taken from slide 46-F2-6A and compared to 46-F3-5A indicated a decrement on

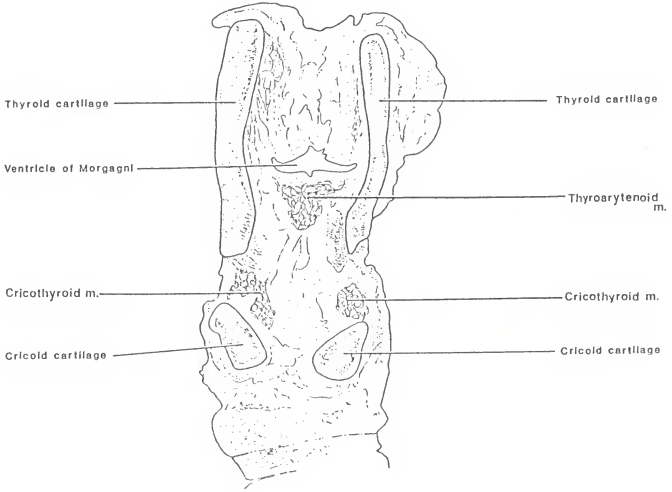


Figure 5. Slide 46-F3-2A/Specimen 3/Coronal Plane/Anterior Block.

all three. Measurements of the left cricothyroid muscle on 46-F3-5A indicated a reduction in area. Thyroid cartilage measures indicated a decrement in the distance between the superior apexes as well as the inferior apexes, while height increased. Vibratory mass measures indicated an increase in the height from the cricoid cartilage to the true vocal fold and a decrease in the medial aspect of the thyroarytenoid muscle to the thyroid cartilage. The overall configuration of the remaining block had become narrowed and the fused tracheal rings clearly present.

Figure 6 (46-F3-18A) represents the 18th photographic slide on film three of the anterior block. This slide was so far forward in the anterior block that all the soft tissue structures of interest ceased to exist. The "U" shaped thyroid cartilage was the only identifiable landmark.

Figure 7 (46-F1-3P) represents the third photographic slide on film one of the posterior block. Identifiable structures included the cricothyroid and thyroarytenoid muscles bilaterally, conus elasticus, arytenoid, cricoid and thyroid cartilages and the pyriform sinus were also identified. This particular slide is listed in the tabular data. Numerical values of this figure are easily compared to the values associated with Figure 1, which was the first anterior block illustration. These figures represent the most medially depicted aspects of the anterior and posterior blocks respectively. Measurement indicated the area of the left cricothyroid muscle, conus elasticus, and the surface width of the right true vocal fold smaller in Figure 7 than in Figure 1. Also the area of the vibratory mass

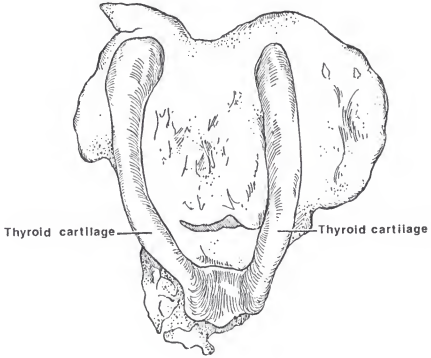


Figure 6. Slide 46-F3-18A/Specimen 3/Coronal Plane/Anterior Block.

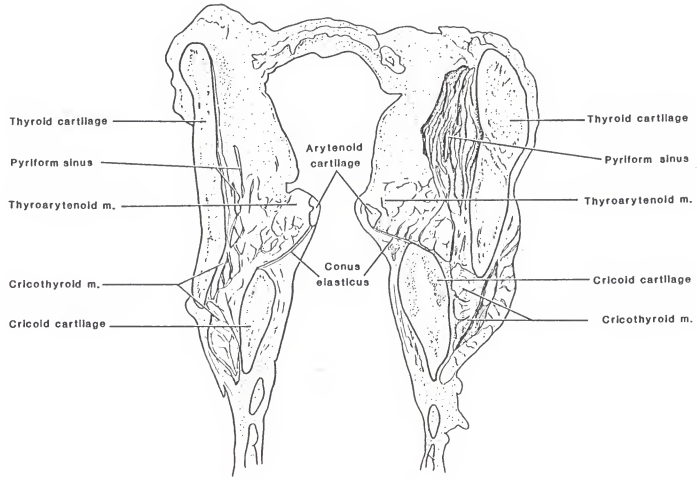


Figure 7. Slide 46-F1-3P/Specimen 3/Coronal Plane/Posterior Block.

measures of the cricoid cartilage to the true vocal fold, the medial aspect of the thyroarytenoid muscle to the thyroid cartilage and the phonatory position were documented as decreased in Figure 7. No value was given for the analogous measure of the true vocal fold surface on the left. Whereas the area of the thyroarytenoid muscles and the area of the right vibratory mass declined. No value was generated for the same structure on the left. Finally, the cartilaginous framework increased in all cases in Figure 7. Visual inspection of Figures 1 and 7 indicate definite configurational changes in musculature, especially the thyroartenoid muscles. The right cricothyroid muscle evidenced a definite boundary. The introduction of the arytenoid cartilages and the pyriform sinus both by their presence indicated posterior progression in block dissection.

Figure 8 (46-F1-17P) represents the 17th photographic slide on film one of the posterior block. Specific structures identified included the right thyroarytenoid muscle, the lateral cricoarytenoid muscles, cricothyroid muscles, right conus elasticus, arytenoid, cricoid and thyroid cartilages and the pyriform sinus. Tabular data indicates the closest slide to Figure 8 (46-F1-17P) was 46-F2-1P. Structural comparison between the measurement values generated for Figure 7 (46-F1-3P) and those of slide 46-F2-1P indicated the following: the left posterior cricoarytenoid muscle had been revealed through sectioning. Also the lateral cricoarytenoid muscle exhibited a definite boundary and was once again a measurable structure in the specimen block. The area of the left cricothyroid and right thyroarytenoid muscles had increased as had the area of the right

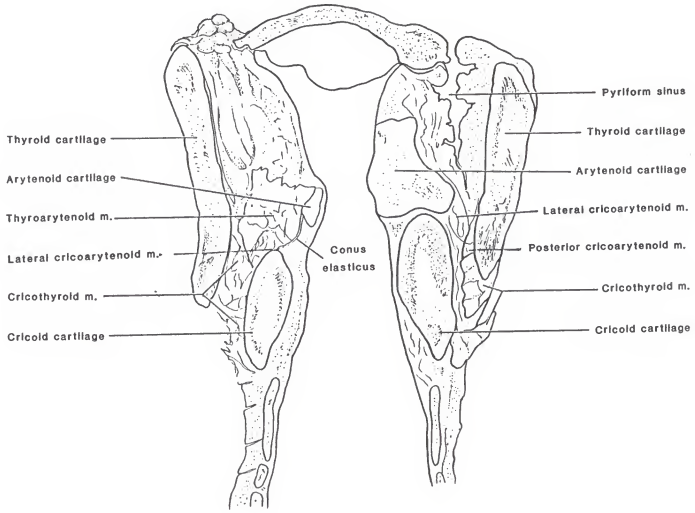


Figure 8. Slide 46-F1-17P/Specimen 3/Coronal Plane/Posterior Block.

vibratory mass and the phonatory position. Whereas the presence of other structures declined. Structures which decreased in size were the conus elasticus, all thyroid cartilage measures and the medial aspect of the thyroarytenoid muscle to the thyroid cartilage. Visual inspection of Figure 8 as compared to Figure 7 demonstrates the folds of the left pyriform sinus disappeared and were replaced by a perforation. The left arytenoid cartilage was nearly entirely exposed. The right side of the specimen revealed the transitional stage of the peeling away of the thyroarytenoid muscle and the discovery of the arytenoid cartilage underneath. The larynx itself had taken on an archway configuration.

Figure 9 (46-F3-2P) represents the second slide on film three of the posterior block. Specific structures identified included the right lateral cricoarytenoid, left posterior cricoarytenoid, fragments of the interarytenoideus muscle, right cricothyroid muscle, articular facet of the cricothyroid joint and the arytenoid, cricoid and thyroid cartilages. Slide 46-F2-16P was selected for comparison purposes. Examination of the tabular data indicates that the right thyroarytenoid muscle, although present in slide 46-F2-16P, had ceased to exist in Figure 9. This same muscle was in the process of being dissected off in Figure 8, and by Figure 9, it had been completely cut away. Measurement values of the slide closest to Figure 8 (46-F1-17P) and the slide closest to Figure 9 were selected for comparison. Those slides were 46-F2-1P and 46-F2-16P respectively. Examination of tabular data reveals soft tissue structures which had increased in area were the posterior cricoarytenoid muscle and the medial aspect of

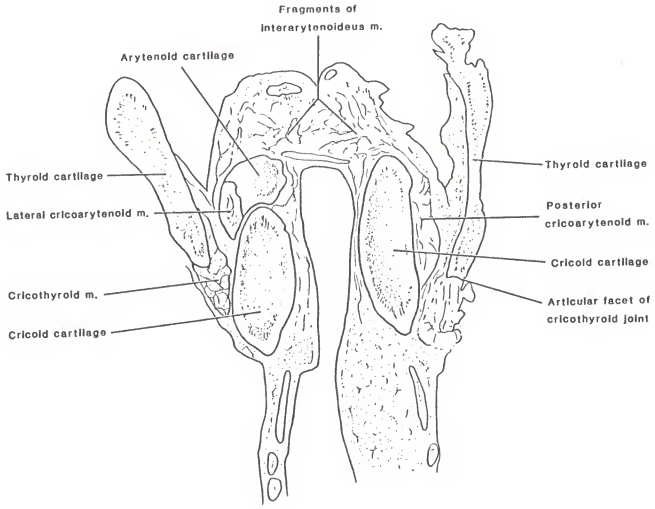


Figure 9. Slide 46-F3-2P/Specimen 3/Coronal Plane/Posterior Block.

the thyroarytenoid muscle to the thyroid cartilage. The phonatory position had also increased. Structures which decreased in size were the right lateral cricoarytenoid, right cricothyroid, and right thyroarytenoid muscles as well as the right vibratory mass. The fragmented interarytenoideus muscle was a new entity in the tabular data at this level. Cartilaginous framework demonstrated an increase in the distance between the superior apexes of the thyroid cartilage, as well as an increase in the distance between the inferior prominences. Height of the thyroid cartilage increased on the right and decreased on the left. Visual examination of Figure 9 (46-F3-2P) reveals the archway effect of the epiglottis to have vanished. The left arytenoid cartilage was replaced by the seemingly ever expanding cricoid cartilage. The right lateral cricoarytenoid muscle had assumed a more lateral position than it had in Figure 8. The conus elasticus and the right thyroartyenoid muscle had ceased to exist. The left posterior cricoarytenoid muscle had aligned itself with the cricoid cartilage. Two final observations which indicated this particular slide for selection were the presence of the articular facet of the cricothyroid joint and the fragmented appearance of the interarytenoideus muscle.

Figure 10 (46-F3-12P) represents the 12th slide on film three of the posterior block. Specific structures identified included the interarytenoideus muscle, right cricothyroid muscle, posterior cricoarytenoid muscles, superior cornu of the thyroid cartilages, arytenoid, cricoid and thyroid cartilages as well as the inferior pharyngeal constrictor muscle. The tabular slide data chosen as

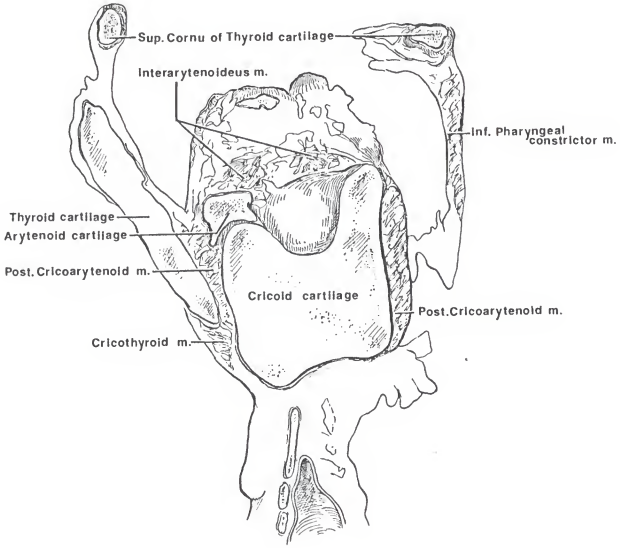


Figure 10. Slide 46-F3-12P/Specimen 3/Coronal Plane/Posterior Block.

closest to Figure 10 (46-F3-12P) were that of slide 46-F3-14P. These data were taken in conjunction with the data presented in slide 46-F2-16P which was previously chosen as closest to Figure 9 (46-F3-2P) and compared. Examination indicated area values for the posterior cricoarytenoid and interarytenoideus muscles were increased in Figure 10 as compared to Figure 9, whereas the values for the cricothyroid muscle decreased. The lateral cricoarytenoid muscle was no longer present. Cartilaginous measures indicated the distance between the superior apexes had decreased as had the height of the thyroid cartilage. Visual inspection revealed the presence of the inferior pharyngeal constrictor muscle, fragmented thyroid cartilage with separate superior cornu, the remnants of the right arytenoid cartilage and a very prevalent cricoid cartilage.

Figure 11 (48-F2-7S) represents the seventh slide on film two of the superior block of specimen 2. Specimen 2 was a transverse dissection specimen. Specific structures of interest included the thyroarytenoid muscles, arytenoid and thyroid cartilages. Since this was a transverse dissection specimen it was cut into three blocks before serial sectioning and the surface of least interest was mounted face down on the block. This block was dissected from its inferior surface proceeding in a superior direction. Primary structures of interest were the thyroarytenoid muscles while the arytenoid and thyroid cartilage served as landmarks. Measurement data were generated only on the thyroarytenoid muscles. Visual inspection revealed a winged cartilaginous appearance.

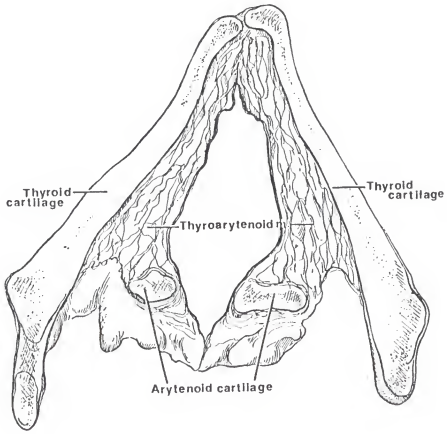


Figure 11. Slide 48-F2-7S/Specimen 2/Transverse Plane/Superior Block.

Figure 12 (48-F1-3M) represents the third slide on film one of the medial block of specimen 2, or an inferior level of the same specimen depicted in Figure 11. In this instance the medial block was at issue and dissection proceeded from a superior to an inferior direction. Tabular data indicates some difference existed between the surrounding slides (48-F1-2M) and 48-F1-4M). Specific structures of interest included bilateral distribution of the thyroarytenoid, lateral cricoarytenoid, and the posterior cricoarytenoid muscles and the cricoid cartilage. The thyroarytenoid muscle ceased to exist as dissection proceeded in an inferior direction. As this muscle dropped out another, the cricothyroid muscle, appeared. Figure 12 (48-F1-3M) reflects the transition in progress as the lateral cricoarytenoid, posterior cricoarytenoid, and the thyroartyenoid muscles were depicted bilaterally with increased area in all lateral and posterior cricoarytenoid muscles. The cartilaginous framework consisted primarily of the cricoid cartilage. Visual examination of Figure 12 reveals a ring shaped structure sparingly draped with musculature.

Figure 13 (75-F1-16R) represents the 16th slide on film one of the right block of specimen 1. Specimen 1 was a sagittal dissection specimen. Specific structures identified included the thyroarytenoid, lateral cricoarytenoid, posterior cricoarytenoid muscles, arytenoid, cricoid, epiglottis and thyroid cartilages. Tabular data indicates the surrounding slides were (75-F1-14R and 75-F1-18R). Both slides concurred with Figure 13 as to the presence of the posterior cricoarytenoid, lateral cricoarytenoid, and thyroarytenoid muscles as soft tissue structures of interest. Area values for all three

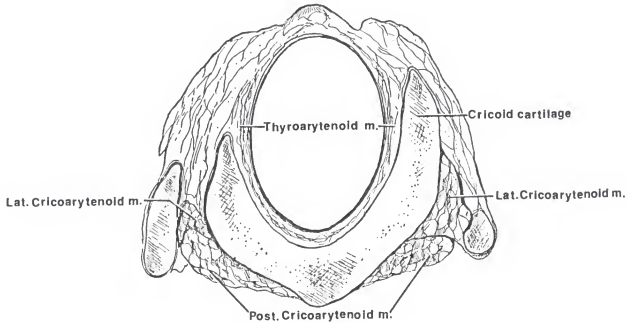


Figure 12. Slide 48-F1-3M/Specimen 2/Transverse Plane/Medial Block.

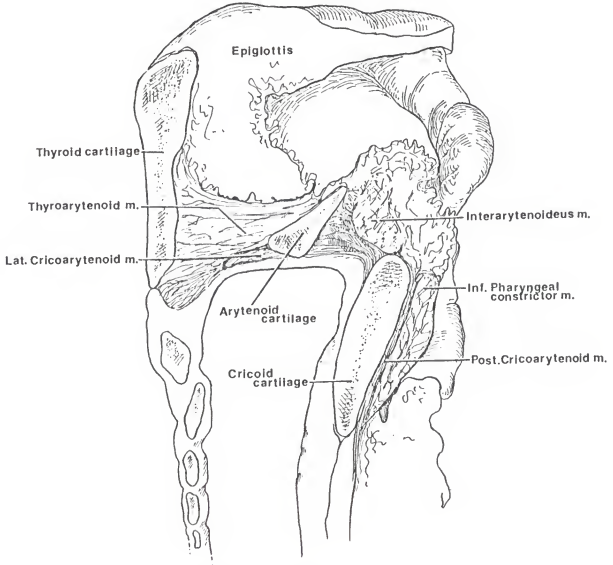


Figure 13. Slide 75-F1-16R/Specimen 1/Sagittal Plane/Right Block.

diminished as dissection proceeded laterally. Visual inspection revealed the inferior pharyngeal constrictor muscle and what appeared to be the fragmented beginning of the interarytenoideus muscle while a nearly midline position was assumed by the arytenoid cartilage.

Figure 14 (75-F2-17R) represents the 17th slide on film two of the right block of specimen 1. Specific structures identified included the thyroarytenoid muscle, cricothyroid muscle, posterior cricoarytenoid muscle, interarytenoideus muscle, arytenoid, cricoid and thyroid cartilages. Tabular data indicate the closest surrounding slide of Figure 14 (75-F2-17R) was 75-F2-18R. This slide listed the interarytenoideus, posterior cricoarytenoid, and cricothyroid muscles as present. The anterior cricoarytenoid ligament was also indicated. Comparison of Figures 13 and 14 as a result of compared tabular data on the slides indicated as closest to the appropriate figures, 75-F1-18R for Figure 13 and 75-F2-18R for Figure 14 respectively, were as listed. Area measurement indicated the posterior cricoarytenoid muscle increased, while the cricothyroid and interarytenoideus muscles were both new additions at the level of dissection for Figure 14. The area of the thyroarytenoid muscle was demonstrated as decreased. Figure 14 did not evidence an anterior cricoarytenoid ligament. Visual examination revealed the most extensive features were a definite interarytenoideus muscle, and the unmistakable characteristic shapes of both the arytenoid and cricoid cartilage.

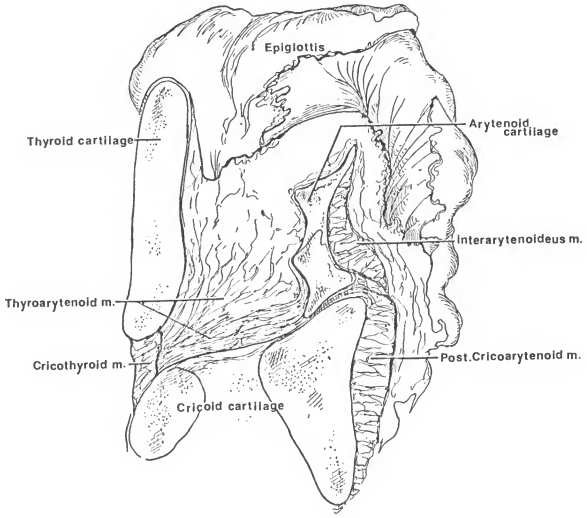


Figure 14. Slide 75-F2-17R/Specimen 1/Sagittal Plane/Right Block.

## Conclusions

The purpose of this study was to examine disease-free adult male larynges in block following serial dissection. A multiplanar approach to serial sectioning allowed measurement of soft tissue structures of interest in the remaining specimen block. This study combined three different empirical phases. All three phases of this study together indicated significant information. It was determined that the block technique of laryngeal assessment was a viable method for experimental studies designed to address the intrinsic laryngeal musculature. It was also indicated that change in the critical structures of interest as well as a means for quantifying that change was possible. And lastly, an empirically derived chemically induced percent shrinkage estimate was established. This variable was never before quantified on laryngeal material. The generated basic data base was intended as incomplete in vivo values. However these values, augmented with the empirically determined shrinkage values of 10% for measurements taken along the course of a muscle and 14% for measurements perpendicular to that course, represent as nearly as possible in vivo values. Concisely, the triad reflected a proven method with quantifiable normative data base combined with a now known chemical shrinkage factor. A series of successive progressive measures contributed to the resolution of the triad. One step along the continuum allowed by the method chosen was that structures were viewed in relation to one another. Specimen blocks were examined for change in soft tissue size and configuration as indicated by the presence of the illustrations and tabular data. Further, this method allowed the possibility of

tracing the course of a particular muscle while transition in other structures was noted. Each muscle was treated singularly, but was viewed in relation to other musculature. Specific muscles were selected out but not removed from their natural habitats. Each identifiable soft tissue structure of interest was identified and measured. This involved area, perimeter and directional parameters of inferior to superior, medial to lateral and the anterior to posterior dimensions. Tabular data incorporated in the appendices reflected the establishment of this basic normative data base. Subsequently the same treatment was given to all other soft tissue structures of interest within a given slide of the remaining block. Muscular course or range was also noted. Although this study addressed intrinsic laryngeal musculature, certain non-muscular structures such as cartilages were utilized primarily as landmarks. The vibratory mass and various aspects of that mass were described in the text but not demarcated on the illustrations. All together these serial successive progressive steps resulted in quantifiable data on adult male intrinsic laryngeal musculature generated to assess the celloidin block embedding technique.

The information available in the tables clearly indicated transition occurred in the size of the various intrinsic musculature. The illustrations, to some degree, capture the configurational transition in some of the same structures. Although these transitions perhaps would have been more evident if it had been possible to include all the available Kodak 35mm slides of each specimen in serial section, and thereby witness the quantitative

change, per specific muscle. It was, however, not possible to include the bulk of the Kodak 35mm slides as a part of this text. It was anticipated that the combination of the illustrations in addition to the measures of each muscle would jointly convey these transitions effectively. In reviewing the various available anatomy texts, it was clear that in many the larynx was given light cursory treatment. Descriptions of laryngeal musculature as previously mentioned were generally relegated to a few paragraphs. One had to ponder why the larynx apparently was such an unimportant organ. Perhaps, the significance of such an organ grew due to increased instrumentation capabilities which in turn allowed a means of putting to task various questions. This was most evident via the engineering and radiological literature (Damste et al., 1968; Hirano, 1977; Hirano et al., 1981; Run and Chung, 1983). Although the engineers' proclivity for the true vocal folds was an exhaustive pursuit to capture and mathematically catalog the very essence of the true folds, other investigators' quests have addressed the true folds as well as other intrinsic musculature (Hirano et al., 1983). Other means of describing and cataloguing were sometimes preferred as mathematical formulas did not always facilitate resolution (Cooper, 1985; Mueller & Sweeney, 1985). Surely the true vocal folds do not accomplish phonation alone, without assistance from other structures (Hirano, 1974, 1977; Hirano et al., 1981, 1983). Although the true vocal folds can be considered critical for phonation, the surrounding musculature likely contributed to the overall structure and function, including phonation, of the larynx. Since the present study was not geared to elucidate

phonation, nor the possible function of a given muscle during phonation, the structures were viewed concommitantly.

## Implications for Future Research

Certain aspects of the method chosen for this study deserve refinement. Block thickness may be altered by designating smaller specimen blocks. Perhaps a smaller block would reduce obscurity due to block thickness and improve visibility. Care, however, must be taken to quantify the actual size of the whole specimen and markers drawn on the specimen denoting the points of intended cut. It is recommended that documentation occur as a result of actual measurement and a photographic record made establishing the size of the whole specimen prior to brain-knife cut. Slides should also be used to demonstrate the areas on the specimen targeted for brain-knife cut and lastly a photographic record should depict the specimen after the block cuts have been established. This will display the actual placement of the cut and assist in determination of what structures are on the fresh surface of the cut. Another aspect of refinement concerns the block surface. Alterations in the block surface perhaps can be controlled for by careful monitoring of staining and clearing procedures to insure consistency. It is also recommended that two different types of trials be conducted, a stain absorption time trial and then a clearing agent trial to better establish the optimal conditions for staining and clearing to avoid any irregularities in the block surface and the resulting stain. Lastly, it is also recommended that two photographic half inch measurement grids be in

each photographic slide. The suggested placement is one on each side of the block. This will obviate any irregularities in camera angle and insure an accurate scale of measure. Apart from suggestions concerning improvements in the methodology utilized in the current study, other research implications include the application of the methodology indicated in additional investigations. One possible study concerns the usage of the celloidin embedded block technique in cases of laryngeal carcinoma. A far more descriptive study would involve determination of the subject's vocal frequency prior to and during a given disease state. Subsequent modeling attempts could best be attempted by an engineer concerned with tissue thickness, elasticity, mass differential and curve fitting to describe the properties of the mass and therefore possible implications concerning vibratory function.

In summary, the block embedding method and photography of the exposed surface of the specimen, as opposed to the traditional histological slice technique, was demonstrated to be a viable method for laryngeal investigation. Though this method was not absolved of all problems, there existed certain advantages in assessment of structures in an intact specimen block. Soft tissue structures of interest and cartilage maintained their proper relationships to one another, while the course and configurational transitions were revealed through serial sectioning. It was possible to consider intrinsic musculature separately or as a group. The block was not subject to tearing although certain stresses were undoubtedly introduced onto the surface of the block from the microtome blade

during dissection. Secondly, a generated normative data base was established regarding laryngeal intrinsic musculature in adult disease-free male specimens. This was a small sample size and data were to be viewed with an awareness of that limitation. Lastly, an empirically derived shrinkage estimate was established in an attempt to assess laryngeal tissue shrinkage as a result of chemical processing. Thereby, a closer approximation of actual in vivo values was possible. Essentially, the celloidin embedding method made possible the preparation of specimens in order that said data were extracted. This in turn was combined with the shrinkage factor which in turn facilitated an approach to elucidate structural dimensions in the living.

APPENDIX A
STRUCTURES OF INTEREST

1. Posterior Cricoarytenoid Muscle
2. Lateral Cricoarytenoid Muscle
3. Interarytenoids
   a. Transverse Arytenoid Muscle
   b. Oblique Arytenoid Muscle
4. Cricothyroid Muscle
   a. Pars Oblique
   b. Pars Recta
5. Thyroarytenoid Muscle
   a. Thyromuscularis
   b. Thyrovocalis
6. Conus Elasticus
   a. Cricothyroid Ligament
   b. Cricothyroid Membrane
7. Quadrangular Membrane
8. Cricoarytenoid Ligaments
   a. Anterior Cricoarytenoid Ligament
   b. Posterior Cricoarytenoid Ligament

*9. Surface width of TVF

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* In the sagittal plane of dissection, this structure is referred to as "height of the TVF."

10. Thyroid Cartilage
    a. Distance between superior apexes
    b. Distance between inferior prominences
    c. Height
11. Vibratory Mass Measures
    a. Height from Cricoid cartilage to TVF
    b. Phonatory position (glottal width/2)
    c. Medial aspect of Thyroarytenoid muscle to Thyroid cartilage
    d. Area

# APPENDIX B
# APPARENT SIZE OF STRUCTURES ARRANGED BY SLIDE

Table B-1. Apparent Size of Structures/Specimen 1/Sagittal Plane/Left Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 75-F1-5L | Interarytenoideus Muscle | .0707 | 1.1431 | .3068 | .2682 |
| 75-F1-9L | Posterior Cricoarytenoid Muscle | .0332 | 1.0662 | .3837 | .0565 |
| | Interarytenoideus Muscle | .0684 | 1.2454 | .2647 | .2664 |
| 75-F1-13L | Posterior Cricoarytenoid Muscle | .0718 | 1.2962 | .4913 | .0689 |
| | Interarytenoideus Muscle | .0645 | 1.1818 | .3184 | .1771 |
| | Thyroarytenoid Muscle | .0461 | .8798 | .3342 | .1285 |
| | Posterior Cricoarytenoid Ligament | | | .2190 | |
| 75-F1-18L | Posterior Cricoarytenoid Muscle | .0711 | 1.5063 | .6244 | .1040 |
| | Interarytenoideus Muscle | .0560 | 1.1498 | .4497 | .0619 |
| | Thyroarytenoid Muscle | .1093 | 1.2671 | .2326 | .4155 |
| | Posterior Cricoarytenoid Ligament | | | .2091 | |
| 75-F2-5L | Posterior Cricoarytenoid Muscle | .0710 | 1.3485 | .5375 | .1034 |
| | Interarytenoideus Muscle | .0127 | .5903 | .1846 | .0216 |
| | Thyroarytenoid Muscle | .3625 | 2.6789 | .2630 | 1.0387 |
| | Posterior Cricoarytenoid Ligament | | | .0629 | |
| 75-F2-9L | Posterior Cricoarytenoid Muscle | .0753 | 1.4958 | .6256 | .1011 |
| | Thyroarytenoid Muscle | .5553 | 2.9600 | .5425 | 1.1944 |

Table B-1--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 75-F2-9L (cont.) | Posterior Cricoarytenoid Ligament | | | .1099 | |
| 75-F2-14L | Posterior Cricoarytenoid Muscle | .0626 | 1.5335 | .6680 | .1079 |
| | Lateral Cricoarytenoid Muscle | .0497 | 1.1466 | .2128 | .3146 |
| | Cricothyroid Muscle | .3260 | 2.6021 | .3953 | 1.0607 |
| | Thyroarytenoid Muscle | .3379 | 2.3723 | .7633 | .4423 |
| | Conus Elasticus -- Cricothyroid Ligament | | | .3567 | |
| 75-F3-1L | Posterior Cricoarytenoid Muscle | .0464 | .9284 | .3931 | .1044 |
| | Cricothyroid Muscle | .2912 | 2.4133 | .6381 | .4925 |
| | Thyroarytenoid Muscle | .0723 | 1.2612 | .2320 | .4319 |
| 75-F3-5L | Thyroarytenoid Muscle | .2114 | 2.0595 | .3273 | .7110 |
| 75-F3-10L | Thyroarytenoid Muscle | .1304 | 1.9755 | .1641 | .6557 |
| 75-F3-14L | Thyroarytenoid Muscle | .2928 | 2.6509 | .4667 | .7022 |

Table B-2. Apparent Size of Structures/Specimen 1/Sagittal Plane/Right Block

| Slide # | Structure | Area (Sq. Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 75-F1-7R | Thyroarytenoid Muscle | .1318 | 2.0219 | .2949 | .6773 |
| 75-F1-10R | Posterior Cricoarytenoid Muscle | .0468 | .8388 | .2694 | .1151 |
| | Thyroarytenoid Muscle | .2292 | 2.4642 | .3717 | .9157 |
| | Thyroid Cartilage | | | 1.0628 | |
| 75-F1-14R | Posterior Cricoarytenoid Muscle | .0528 | .9230 | .2926 | .1077 |
| | Lateral Cricoarytenoid Muscle | .0381 | .8314 | .2240 | .0606 |
| | Thyroarytenoid Muscle | .2855 | 2.5105 | .4953 | .7123 |
| | Thyroid Cartilage | | | 1.1093 | |
| 75-F1-18R | Posterior Cricoarytenoid Muscle | .0395 | .8420 | .2545 | .1254 |
| | Lateral Cricoarytenoid Muscle | .0087 | .4817 | .0866 | .0932 |
| | Thyroarytenoid Muscle | .2517 | 2.5753 | .3719 | .7938 |
| | Anterior Cricoarytenoid Ligament | .5944 | | | |
| | Thyroid Cartilage | | | 1.0378 | |
| 75-F2-3R | Posterior Cricoarytenoid Muscle | .0439 | .8940 | .3089 | .1116 |
| | Lateral Cricoarytenoid Muscle | .0368 | 1.0733 | .2972 | .2483 |
| | Thyroarytenoid Muscle | .2595 | 2.5892 | .3084 | .6724 |
| | Anterior Cricoarytenoid Ligament | .6189 | | | |

Table B-2--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 75-F2-3R (cont.) | Thyroid Cartilage | | | .9614 | |
| 75-F2-9R | Posterior Cricoarytenoid Muscle | .0489 | .9773 | .2760 | .1361 |
| | Cricothyroid Muscle | .0511 | 1.2982 | .5173 | .0828 |
| | Thyroarytenoid Muscle | .2747 | 1.999 | .4168 | .5179 |
| | Anterior Cricoarytenoid Ligament | .3941 | | | |
| | Thyroid Cartilage | | | .9306 | |
| 75-F2-13R | Posterior Cricoarytenoid Muscle | .0211 | .6673 | .1951 | .0819 |
| | Cricothyroid Muscle | .0745 | 1.2826 | .4429 | .1122 |
| | Thyroarytenoid Muscle | .3309 | 2.2542 | .6543 | .4656 |
| | Thyroid Cartilage | | | 1.0544 | |
| 75-F2-18R | Interarytenoideus Muscle | .0346 | 1.0269 | .4081 | .0629 |
| | Posterior Cricoarytenoid Muscle | .0859 | 1.8817 | .7122 | .1023 |
| | Cricothyroid Muscle | .0531 | 1.0358 | .3938 | .1174 |
| | Thyroarytenoid Muscle | .0741 | 1.4425 | .1536 | .4873 |
| | Anterior Cricoarytenoid Ligament | .7455 | | | |
| | Thyroid Cartilage | | | .7618 | |
| 75-F3-6R | Posterior Cricoarytenoid Muscle | .0749 | 1.4190 | .6045 | .1129 |
| | Interarytenoideus Muscle | .0324 | .9207 | .3433 | .0300 |

Table B-2--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 75-F3-6R (cont.) | Cricothyroid Muscle | .0671 | 1.0945 | .3199 | .1495 |
| | Thyroarytenoid Muscle | .1499 | 1.7387 | .1725 | .6242 |
| | Anterior Cricoarytenoid Ligament | .5145 | | | |
| | Thyroid Cartilage | | | .9296 | |
| 75-F3-9R | Posterior Cricoarytenoid Muscle | .0972 | 1.6961 | .6931 | .1149 |
| | Interarytenoideus Muscle | .0258 | 1.1329 | .4390 | .0446 |
| | Thyroarytenoid Muscle | .0902 | 1.3978 | .4474 | .1639 |
| | Thyroid Cartilage | | | .9534 | |
| 75-F3-13R | Posterior Cricoarytenoid Muscle | .0672 | 1.2091 | .4379 | .1514 |
| | Interarytenoideus Muscle | .0725 | 1.2628 | .4163 | .1019 |
| | Cricothyroid Muscle | .0605 | 1.2089 | .4766 | .1551 |
| | Thyroarytenoid Muscle | .0747 | 1.1475 | .2457 | .3353 |
| | Anterior Cricoarytenoid Ligament | .0733 | | | |
| | Posterior Cricoarytenoid Ligament | .0640 | | | |
| | Thyroid Cartilage | | | .8256 | |
| 75-F3-17R | Posterior Cricoarytenoid Muscle | .0784 | 1.4652 | .5421 | .0909 |
| | Interarytenoideus Muscle | .0214 | .6236 | .1524 | .0650 |
| | Cricothyroid Muscle | .0978 | 1.5023 | .6228 | .1260 |

Table B-2--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 75-F3-17R (cont.) | Thyroarytenoid Muscle | .0626 | .9493 | .1428 | .2108 |
| | Thyroid Cartilage | | | .8343 | |
| 75-F4-3R | Thyroid Cartilage | | | .9030 | |
| 75-F4-6R | Thyroid Cartilage | | | 1.1037 | |

Table B-3. Apparent Size of Structures/Specimen 2/Transverse Plane/Superior Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 48-F1-1S | Posterior Cricoarytenoid Muscle | .0320L* | 1.0162L | .1025L | .3930L |
| | | .0197R | .7225R | .0767R | .2932R |
| | Lateral Cricoarytenoid Muscle | .0345R | 1.5641R | .6469R | .0444R |
| | Interarytenoideus Muscle | .1064L | 1.8258L | .6315L | .1581L |
| | | .0760R | 1.6346R | .6567R | .1489R |
| 48-F1-3S | Posterior Cricoarytenoid Muscle | .0255L | .7777L | .0713L | .2946L |
| | | .0090R | .4071R | .0544R | .2177R |
| | Lateral Cricoarytenoid Muscle | .0330L | 1.6164L | .6423L | .0621L |
| | | .0402R | 1.4805R | .6240R | .0344R |
| | Thyroarytenoid Muscle | .0964L | 1.9906L | .8567L | .1750L |
| | | .1040R | 1.7785R | .6959R | .1241R |
| 48-F1-5S | Posterior Cricoarytenoid Muscle | .0170L | .7776L | .0524L | .3097L |
| | | .0060R | .4200R | .0359R | .1717R |
| | Lateral Cricoarytenoid Muscle | .0570L | 1.4869L | .6105L | .0855L |
| | | .0480R | 1.5244R | .6782R | .0499R |
| | Thyroarytenoid Muscle | .2059L | 2.5773L | .8108L | .2413L |
| | | .1620R | 2.1371R | .8737R | .1773R |
| 48-F1-7S | Posterior Cricoarytenoid Muscle | .0092L | .6432L | .0189L | .2546L |
| | | .0020R | .2769R | .0142R | .1242R |
| | Lateral Cricoarytenoid Muscle | .1457L | 2.2453L | 1.0320L | .1370L |
| | | .0897R | 1.7136R | .7249R | .1619R |
| | Thyroarytenoid Muscle | .0906L | 2.4542L | 1.0513L | .1072L |
| | | .0682R | 1.4426R | .5567R | .1351R |

Table B-3--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 48-F1-9S | Posterior Cricoarytenoid Muscle | .0075L | .5468L | .0211L | .2009L |
| | Thyroarytenoid Muscle | .1448L<br>.1629R | 2.1263L<br>1.9569R | .8937L<br>.7534R | .2528L<br>.1991R |
| 48-F1-11S | Interarytenoideus Muscle | .0641 | 1.5353 | .1575 | .5488 |
| | Thyroarytenoid Muscle | .2008L<br>.1700R | 2.4097L<br>1.9276R | .8879L<br>.7193R | .2327L<br>.1691R |
| | Posterior Cricoarytenoid Ligament | .0520 | 1.3507 | .2008 | .3505 |
| 48-F1-13S | Interarytenoideus Muscle | .1213 | 1.8233 | .1381 | .7961 |
| | Thyroarytenoid Muscle | .1529L<br>.1054R | 2.8661L<br>1.9985R | .7762L<br>.9418R | .2527L<br>.1583R |
| 48-F1-15S | Interarytenoideus Muscle | .0955 | 1.6081 | .1082 | .6586 |
| | Thyroarytenoid Muscle | .1034L<br>.0835R | 2.1327L<br>1.8802R | .8983L<br>.7590R | .2468L<br>.1946R |
| 48-F2-1S | Interarytenoideus Muscle | .0873 | 1.6997 | .0909 | .7681 |
| | Thyroarytenoid Muscle | .1179L<br>.1266R | 2.2061L<br>2.1804R | .7507L<br>.8851R | .1385L<br>.1336R |
| 48-F2-3S | Interarytenoideus Muscle | .0597 | 1.5798 | .0721 | .6667 |
| | Thyroarytenoid Muscle | .0996L<br>.1087R | 1.7850L<br>1.8041R | .6382L<br>.6907R | .1225L<br>.1489R |
| 48-F2-5S | Interarytenoideus Muscle | .0432 | 1.4788 | .0930 | .6529 |
| | Thyroarytenoid Muscle | .1378L<br>.0802R | 2.2892L<br>1.8075R | .9084L<br>.8836R | .1250L<br>.0832R |
| 48-F2-7S | Thyroarytenoid Muscle | .1390L<br>.1487R | 2.1711L<br>2.1528R | .9096L<br>.8257R | .1854L<br>.1155R |

Table B-3--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 48-F2-9S | Thyroarytenoid Muscle | .0950L<br>.0719R | 2.0835L<br>1.5469R | .7782L<br>.6469R | .1755L<br>.0931R |
| 48-F2-11S | Thyroarytenoid Muscle | .0518L<br>.0812R | 1.1320L<br>1.3308R | .4329L<br>.4815R | .1263L<br>.1596R |

* L = left, R = right; no letter = neither L nor R is indicated.

Table B-4. Apparent Size of Structures/Specimen 2/Transverse Plane/Medial Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 48-F1-2M | Posterior Cricoarytenoid Muscle | .0466L* | 1.1083L | .1314L | .4178L |
| | | .0279R | .8675R | .0664R | .3010R |
| | Lateral Cricoarytenoid Muscle | .0282L | 1.1542L | .3064L | .0321L |
| | | .0124R | .7009R | .2680R | .0485R |
| | Thyroarytenoid Muscle | .0357L | 1.1863L | .4688L | .0552L |
| 48-F1-4M | Posterior Cricoarytenoid Muscle | .0540L | 1.3120L | .1415L | .6152L |
| | | .0394R | 1.1178R | .1263R | .4763R |
| | Lateral Cricoarytenoid Muscle | .0316L | 1.1355L | .5790L | .0707L |
| | | .0418R | 1.1833R | .3971R | .2564R |
| | Cricothyroid Muscle | .0951L | 1.9443L | .7280L | .1401L |
| | | .0557R | 1.6339R | .7107R | .1087R |
| 48-F1-6M | Posterior Cricoarytenoid Muscle | .0481L | 1.1443L | .1418L | .5226L |
| | | .0366R | 1.0786R | .1202R | .4642R |
| | Lateral Cricoarytenoid Muscle | .0317L | 1.1873L | .5499L | .1168L |
| | | .0320R | 1.2678R | .4924R | .1328R |
| | Cricothyroid Muscle | .1165L | 1.9706L | .8813L | .1294L |
| 48-F1-8M | Posterior Cricoarytenoid Muscle | .0277L | .8981L | .0741L | .3691L |
| | | .0279R | .8293R | .0580R | .3159R |
| | Lateral Cricoarytenoid Muscle | .0277L | .9813L | .3376L | .0784L |
| | | .0267R | 1.1356R | .4038R | .0655R |
| | Cricothyroid Muscle | .0744L | 1.9001L | .7335L | .0680L |

Table B-4--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 48-F1-10M | Posterior Cricoarytenoid Muscle | .0319L<br>.0204R | .9922L<br>.7256R | .0616L<br>.0954R | .3884L<br>.2921R |
| | Lateral Cricoarytenoid Muscle | .0221L | .9665L | .3392L | .0673L |
| | Cricothyroid Muscle | .0945L<br>.0341R | 2.3980L<br>1.8636R | .8588L<br>.9708R | .0808L<br>.0417R |
| 48-F1-12M | Posterior Cricoarytenoid Muscle | .0386L<br>.0309R | 1.1756L<br>1.1624R | .1067L<br>.0361R | .4907L<br>.5470R |
| | Lateral Cricoarytenoid Muscle | .0405L | 1.1063L | .3854L | .1163L |
| | Cricothyroid Muscle | .0758L<br>.0499R | 2.2403L<br>2.0943R | .9797L<br>.9150R | .0558L<br>.0364R |
| 48-F1-14M | Posterior Cricoarytenoid Muscle | .0292L<br>.0297R | 1.0321L<br>1.2766R | .1147L<br>.0285R | .4699L<br>.5856R |
| | Lateral Cricoarytenoid Muscle | .0372L | .9768L | .3903L | .1454L |
| | Cricothyroid Muscle | .0876L<br>.0216R | 2.3492L<br>1.2152R | 1.1252L<br>.4292R | .0515L<br>.0174R |
| 48-F1-16M | Posterior Cricoarytenoid Muscle | .0224L<br>.0191R | .9535L<br>1.1222R | .0817L<br>.0274R | .3226L<br>.5717R |
| | Lateral Cricoarytenoid Muscle | .0290L | .8346L | .3131L | .1355L |
| | Cricothyroid Muscle | .0599L<br>.0181R | 2.1333L<br>1.1947R | .8408L<br>.5432R | .0388L<br>.0512R |
| 48-F1-18M | Posterior Cricoarytenoid Muscle | .0252L<br>.0195R | .9875L<br>1.0592R | .0418L<br>.0238R | .3616L<br>.3796R |

Table B-4--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 48-F1-18M (cont.) | Lateral Cricoarytenoid Muscle | .0259L | .7413L | .1990L | .1191L |
| | Cricothyroid Muscle | .0534L | 1.7257L | .6689L | .0505L |
| | | .0382R | 1.6771R | .0993R | .7622R |
| 48-F2-2M | Posterior Cricoarytenoid Muscle | .0241L | 1.0599L | .0628L | .3658L |
| | | .0121R | .9365R | .0161R | .3215R |
| | Lateral Cricoarytenoid Muscle | .0184L | .7077L | .1642L | .0712L |
| | Cricothyroid Muscle | .0442L | 1.6849L | .6191L | .0633L |
| | | .0368R | 1.8994R | .8610R | .0744R |
| 48-F2-4M | Posterior Cricoarytenoid Muscle | .0198L | .9567L | .4076L | .0616L |
| | | .0116R | .7490R | .3073R | .0140R |
| | Lateral Cricoarytenoid Muscle | .0320L | 1.0130L | .3191L | .0938L |
| | Cricothyroid Muscle | .0504L | 1.5878L | .5061L | .0423L |
| | | .0654R | 2.1769R | .3238R | .0685R |

* L = left, R = right; no letter = neither L nor R is indicated.

Table B-5. Apparent Size of Structures/Specimen 3/Coronal Plane/Anterior Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-4A | Cricothyroid Muscle | .0908L* | 1.5171L | .6043L | .2764L |
| | Thyroarytenoid Muscle | .0646L | 1.2746L | .4120L | .5223L |
| | | .0172R | .6164R | .2143R | .1261R |
| | Conus Elasticus | | | .4542L | |
| | | | | .5153R | |
| | Surface Width of TVF | | | | .2002L |
| | | | | | .1925R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1285 |
| | -- Distance between Inferior Prominences | | | | 1.2552 |
| | -- Height | | | 1.2024L | |
| | | | | 1.2296R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .3476L | |
| | | | | .4152R | |
| | -- Phonatory Position (glottal width/2) | | | | .0878 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3186L |
| | | | | | .2229R |
| | -- Area of Vibratory Mass | .1898L | 1.8356L | .4141L | .5136L |
| | | | | .2924L | .3926L |
| | | .1388R | 1.4779R | .3934R | .2554R |
| 46-F1-8A | Cricothyroid Muscle | .0794L | 1.4152L | .5114L | .1684L |
| | Thyroarytenoid Muscle | .0984L | 1.2688L | .3064L | .2287L |
| | | .0608R | 1.1227R | .3632R | .1768R |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-8A (cont.) | Conus Elasticus | | | .4764L<br>.5311R | |
| | Surface Width of TVF | | | | .1908L<br>.1868R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.0641 |
| | -- Distance between Inferior Prominences | | | | 1.2651 |
| | -- Height | | | 1.1018L<br>1.0777R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .3535L<br>.4210R | |
| | -- Phonatory Position (glottal width/2) | | | | .0667 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3201L<br>.2064R |
| | -- Area of Vibratory Mass | .1651L<br>.1384R | 1.5717L<br>1.4454R | .3560L<br>.4099R | .3683L<br>.2742R |
| 46-F1-11A | Cricothyroid Muscle | .0328L | 1.2800L | .5131L | .1669L |
| | Thyroarytenoid Muscle | .0776L<br>.0690R | 1.1051L<br>1.0829R | .3325L<br>.3823R | .2914L<br>.1982R |
| | Conus Elasticus | | | .4716L<br>.5591R | |
| | Surface Width of TVF | | | | .1489L<br>.1563R |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-11A (cont.) | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1126 |
| | -- Distance between Inferior Prominences | | | | 1.2332 |
| | -- Height | | | 1.2295L<br>1.1238R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .2961L<br>.3691R | |
| | -- Phonatory Position (glottal width/2) | | | | .0886 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3009L<br>.2470R |
| | -- Area of Vibratory Mass | .1185L<br>.1360R | 1.2637L<br>1.4678R | .3550L<br>.3487R | .3378L<br>.2649R |
| 46-F1-14A | Cricothyroid Muscle | .0829L | 1.4870L | .5604L | .1924L |
| | Thyroarytenoid Muscle | .0831L<br>.0537R | 1.2322L<br>1.0832R | .3168L<br>.3600R | .2833L<br>.1873R |
| | Conus Elasticus | | | .4869L<br>.5497R | |
| | Surface Width of TVF | | | | .1997L<br>.1908R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1497 |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-14A (cont.) | Thyroid Cartilage -- Distance between Inferior Prominences | | | | 1.3148 |
| | -- Height | | | 1.2341L<br>1.0196R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .3546L<br>.4081R | |
| | -- Phonatory Position (glottal width/2) | | | | .0926 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2947L<br>.2206R |
| | -- Area of Vibratory Mass | .1518L<br>.1534R | 1.5276L<br>1.5675R | .4133L<br>.5938R | .3516L<br>.2491R |
| 46-F2-1A | Lateral Cricoarytenoid Muscle | .0057L | .3071L | .0846L | .0736L |
| | Cricothyroid Muscle | .0412L | .9792L | .3256L | .1243L |
| | Thyroarytenoid Muscle | .0687L<br>.0604R | 1.0864L<br>1.1418R | .3312L<br>.4266R | .2587L<br>.2246R |
| | Conus Elasticus | | | .4998L<br>.5140R | |
| | Surface Width of TVF | | | | .1731L<br>.1090R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.0305 |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-1A (cont.) | Thyroid Cartilage -- Distance between Inferior Prominences | | | | 1.1919 |
| | -- Height | | | 1.3601L<br>1.1250R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .4183L<br>.5035R | |
| | -- Phonatory Position (glottal width/2) | | | | .0893 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2722L<br>.1851R |
| | -- Area of Vibratory Mass | .1402L<br>.1553R | 1.4667L<br>1.7744R | .4280L<br>.6815R | .3187L<br>.2117R |
| 46-F2-6A | Lateral Cricoarytenoid Muscle | .0137L | .4907L | .1605L | .1544L |
| | Cricothyroid Muscle | .0219L | .8010L | .3072L | .0976L |
| | Thyroarytenoid Muscle | .0633L<br>.0449R | .9813L<br>1.2506R | .2964L<br>1.5469R | .2549L<br>.1903R |
| | Conus Elasticus | | | .5855L<br>.5341R | |
| | Surface Width of TVF | | | | .2057L<br>.2380R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .9390 |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-6A (cont.) | Thyroid Cartilage -- Distance between Inferior Prominences | | | | 1.1598 |
| | -- Height | | | 1.3680L<br>1.1036R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .4220L<br>.5214R | |
| | -- Phonatory Position (glottal width/2) | | | | .0710 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2666L<br>.1685R |
| | -- Area of Vibratory Mass | .1506L<br>.1063R | 1.7656L<br>1.3258R | .4801L<br>.5412R | .3004L<br>.2147R |
| 46-F2-13A | Lateral Cricoarytenoid Muscle | .0170L | .5369L | .1573L | .1123L |
| | Cricothyroid Muscle | .0295L | .8304L | .3870L | .0931L |
| | Thyroarytenoid Muscle | .0462L<br>.0343R | .9206L<br>.7473R | .3387L<br>.2811R | .2732L<br>.1597R |
| | Conus Elasticus | | | .4976R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .7440 |
| | -- Distance between Inferior Prominences | | | | .8972 |
| | -- Height | | | 1.2130L<br>1.0039R | |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-13A (cont.) | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .5190L<br>.5857R | |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2372L<br>.1584R |
| 46-F2-18A | Thyroarytenoid Muscle | .0567L<br>.0304R | .9853L<br>.8816R | .2903L<br>.3545R | .1476L<br>.1389R |
| | Conus Elasticus | | | .6277L<br>.6235R | |
| | Surface Width of TVF | | | | .1885L<br>.1923R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .5776 |
| | -- Distance between Inferior Prominences | | | | .6686 |
| | -- Height | | | 1.2609L<br>1.0358R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .6422L<br>.6880R | |
| | -- Phonatory Position (glottal width/2) | | | | .0127 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1608L<br>.0670R |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-18A (cont.) | -- Area of Vibratory Mass | .1048L<br>.0768R | 1.3948L<br>1.2301R | .4701L<br>.4454R | .2195L<br>.1356R |
| 46-F3-5A | Cricothyroid Muscle | .0288L<br>.0154R | .6632L<br>.5228R | .1771L<br>.1491R | .1231L<br>.0742R |
| | Thyroarytenoid Muscle (Thyromuscularis) | .0294L<br>.0179R | .8176L<br>.6546R | .2998L<br>.2903R | .0898L<br>.0510R |
| | Thyrovocalis Muscle | | | .3465L<br>.2925R | .1185L<br>.0864R |
| | Surface Width of TVF | | | .1683L<br>.1910R | |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | .4799 |
| | -- Distance between Inferior Prominences | | | | .4602 |
| | -- Height | | | 1.1228L<br>.9953R | |
| | Vibratory Mass Measures<br>-- Height from Cricoid to TVF | | | .6247L<br>.7314R | |
| | -- Phonatory Position (glottal width/2) | | | | .0140 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .0769L<br>.0628R |
| | -- Area of Vibratory Mass | .0502L<br>.0633R | .9391L<br>.12287R | .3079L<br>.3050R | .1294L<br>.1161R |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F3-9A | Cricothyroid Muscle | .0248L<br>.0104R | .5790L<br>.4595R | .1228L<br>.1169R | .1313L<br>.0663R |
| | Thyroarytenoid Muscle | .0184L<br>.0205R | .6306L<br>.7587R | .2201L<br>.2754R | .0440L<br>.1577R |
| | Surface Width of TVF | | | | .1431L<br>.1760R |
| | Thyroid Cartilage<br>-- Distance between<br>Superior Apexes | | | | .4235 |
| | -- Distance between<br>Inferior Prominences | | | | .3998 |
| | -- Height | | | 1.0588L<br>.9675R | |
| | Vibratory Mass Measures<br>-- Height from Cricoid<br>to TVF | | | .6906L<br>.7041R | |
| | -- Phonatory Position<br>(glottal width/2) | | | | .0006 |
| | -- Medial Aspect of<br>Thyroarytenoid to<br>Thyroid Cartilage | | | | .0440L<br>.1577R |
| | -- Area of Vibratory Mass | .0458L<br>.0383R | .9668L<br>.9387R | .2947L<br>.3000R | .1682L<br>.1577R |
| 46-F3-14A | Thyroid Cartilage<br>-- Distance between<br>Superior Apexes | | | | .4123 |
| | -- Distance between<br>Inferior Prominences | | | | .3175 |

Table B-5--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F3-14A (cont.) | Thyroid Cartilage -- Height | | | 1.0165L .9474R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .1656L .1488R | |
| | -- Phonatory Position (glottal width/2) | | | | .0060 |
| 46-F4-2A | Thyroid Cartilage -- Distance between Superior Apexes | | | | .3962 |
| | -- Distance between Inferior Prominences | | | | .1519 |
| | -- Height | | | .9398L .9642R | |
| 46-F4-7A | Thyroid Cartilage -- Distance between Superior Apexes | | | | .3595 |
| | -- Distance between Inferior Prominences | | | | .2040 |
| | -- Height | | | .7190L .6855R | |
| 46-F4-12A | Thyroid Cartilage -- Distance between Superior Apexes | | | | .3856 |
| | -- Distance between Inferior Prominences | | | | .1908 |
| | -- Height | | | .7071L .7077R | |

* L = left, R = right; no letter = neither L nor R is indicated.

Table B-6. Apparent Size of Structures/Specimen 3/Coronal Plane/Posterior Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-3P | Cricothyroid Muscle | .0458L* | .9319L | .3385L | .0982L |
| | | .0491R | 1.0776R | .3490R | .1036R |
| | Thyroarytenoid Muscle | .1157L | 1.3751L | .3095L | .3482L |
| | | .1004R | 1.3007R | .4257R | .2123R |
| | Conus Elasticus | | | .4653L | |
| | | | | .3877R | |
| | Surface Width of TVF | | | | .0890R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.6395 |
| | -- Distance between Inferior Prominences | | | | 1.5893 |
| | -- Height | | | 1.5106L | |
| | | | | 1.3498R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .3419R | |
| | -- Phonatory Position (glottal width/2) | | | | .0609 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .5178L |
| | | | | | .3509R |
| | -- Area of Vibratory Mass | .1409R | 1.6238R | .3616R | .3195R |
| 46-F1-9P | Cricothyroid Muscle | .0379L | .8679L | .3592L | .1145L |
| | | .0545R | 1.2233R | .5716R | .1491R |
| | Thyroarytenoid Muscle | .0614 | 1.1498 | .2413 | .2704 |
| | | .0854R | 1.2700R | .2510R | .2872R |
| | Conus Elasticus | | | .3438R | |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-9P (cont.) | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.7539 |
| | -- Distance between Inferior Prominences | | | | 1.6197 |
| | -- Height | | | .7042L<br>1.5368R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .2797R | |
| | -- Phonatory Position (glottal width/2) | | | | .0713 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .4674L<br>.3478R |
| | -- Area of Vibratory Mass | .1868R | 1.6161R | .4423R | .3801R |
| 46-F1-14P | Posterior Cricoarytenoid Muscle | .0206L | .6157L | .1877L | .1700L |
| | Lateral Cricoarytenoid Muscle | .0280L<br>.0420R | .7091L<br>.8419R | .3240L<br>.2482R | .1757L<br>.2527R |
| | Cricothyroid Muscle | .0493L<br>.0874R | 1.2822L<br>1.4708R | .4014L<br>.6906R | .2366L<br>.2346R |
| | Thyroarytenoid Muscle | .0800L<br>.1425R | 1.3600L<br>1.6227R | .2111L<br>.4342R | .3331L<br>.3659R |
| | Conus Elasticus | | | .3137R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.7439 |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F1-14P (cont.) | Thyroid Cartilage -- Distance between Inferior Prominences | | | | 1.5995 |
| | -- Height | | | 1.2618L<br>1.5103R | |
| | Vibratory Mass Measures -- Phonatory Position (glottal width/2) | | | | .0837 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .4193L<br>.3631R |
| | -- Area of Vibratory Mass | .1337R | 1.4625R | .3399R | .3958R |
| 46-F2-1P | Posterior Cricoarytenoid Muscle | .0224L | .6647L | .2776L | .1189L |
| | Lateral Cricoarytenoid Muscle | .0597R | 1.0220R | .2618R | .3296R |
| | Cricothyroid Muscle | .0645R | 1.3436R | .5986R | .1585R |
| | Thyroarytenoid Muscle | .2169R | 1.8345R | .5997R | .5212R |
| | Conus Elasticus | | | .2040R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.5532 |
| | -- Distance between Inferior Prominences | | | | 1.2922 |
| | -- Height | | | 1.3136L<br>.8739R | |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-1P (cont.) | Vibratory Mass Measures -- Phonatory Position (glottal width/2) | | | | .0794 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1055L<br>.2970R |
| | -- Area of Vibratory Mass | .1728R | 1.6224R | .4211R | .3592R |
| 46-F2-6P | Posterior Cricoarytenoid Muscle | .0114L | .4692L | .1849L | .0781L |
| | Lateral Cricoarytenoid Muscle | .0211R | .7150R | .1880R | .1836R |
| | Cricothyroid Muscle | .0600R | 1.3137R | .5853R | .2284R |
| | Thyroarytenoid Muscle | .0610R | 1.1619R | .2981R | .2892R |
| | Conus Elasticus | | | .2064R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.5327 |
| | -- Distance between Inferior Prominences | | | | 1.2827 |
| | -- Height | | | 1.3113L<br>1.0926R | |
| | Vibratory Mass Measures -- Phonatory Position (glottal width/2) | | | | .0853 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3660R |
| | -- Area of Vibratory Mass | .2076R | 1.9591R | .4165R | .4196R |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-11P | Posterior Cricoarytenoid Muscle | .0276L | .9311L | .4446L | .0999L |
| | Lateral Cricoarytenoid Muscle | .0232R | .7393R | .2003R | .1538R |
| | Cricothyroid Muscle | .0573R | 1.1898R | .5385R | .2024R |
| | Thyroarytenoid Muscle | .0581R | 1.4657R | .2459R | .3140R |
| | Conus Elasticus | | | .1763R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.5598 |
| | -- Distance between Inferior Prominences | | | | 1.2531 |
| | -- Height | | | 1.2664L<br>1.0713R | |
| | Vibratory Mass Measures -- Phonatory Position (glottal width/2) | | | | .0652 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3582R |
| | -- Area of Vibratory Mass | .1850R | 1.8736R | .3316R | .3887R |
| 46-F2-16P | Posterior Cricoarytenoid Muscle | .0465L | 1.1882L | .5848L | .0968L |
| | Lateral Cricoarytenoid Muscle | .0208R | .5632R | .1742R | .1839R |
| | Interarytenoideus Muscle | .0776 | 1.7639 | .3120 | .2592 |
| | Cricothyroid Muscle | .0637R | 1.3206R | .6024R | .2009R |
| | Thyroarytenoid Muscle | .0414R | .8371R | .2948R | .2300R |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F2-16P (cont.) | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.7542 |
| | -- Distance between Inferior Prominences | | | | 1.2983 |
| | -- Height | | | 1.3072L 1.1630R | |
| | Vibratory Mass Measures -- Phonatory Position (glottal width/2) | | | | .0977 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3331R |
| | -- Area of Vibratory Mass | .1292R | 1.7040R | .3720R | .3411R |
| 46-F3-4P | Posterior Cricoarytenoid Muscle | .0627L .0208R | 1.5894L .6511R | .8020L .2971R | .1249L .0980R |
| | Interarytenoideus Muscle | .1340 | 1.7089 | .3489 | .6986 |
| | Cricothyroid Muscle | .0527R | 1.2340R | .5602R | .1599R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.8488 |
| | -- Distance between Inferior Prominences | | | | 1.2735 |
| | -- Height | | | .8954L 1.0996R | |
| | Vibratory Mass Measures -- Phonatory Position (glottal width/2) | | | | .0900 |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F3-9P | Posterior Cricoarytenoid Muscle | .0805L<br>.0190R | 1.9273L<br>.5728R | .9157L<br>.2407R | .1144L<br>.1043R |
| | Interarytenoideus Muscle | .1096 | 1.6641 | .2559 | .6781 |
| | Cricothyroid Muscle | .0274R | 1.0486R | .3774R | .1290R |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | 1.8120 |
| | -- Distance between Inferior Prominences | | | | 1.3809 |
| | -- Height | | | .6944L<br>1.1018R | |
| | Vibratory Mass Measures<br>-- Phonatory Position (glottal width/2) | | | | .0814 |
| 46-F3-14P | Posterior Cricoarytenoid Muscle | .0754L<br>.0069R | 1.8037L<br>.5042R | .8635L<br>.2408R | .1321L<br>.0452R |
| | Interarytenoideus Muscle | .1031 | 1.4920 | .3221 | .5809 |
| | Cricothyroid Muscle | .0226R | 1.1492R | .1737R | .1301R |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | 1.7285 |
| | -- Height | | | 1.1483R | |
| 46-F4-6P | Posterior Cricoarytenoid Muscle | .0431L<br>.0300R | 1.4604L<br>1.0539R | .6523L<br>.4636R | .0993L<br>.0656R |

Table B-6--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 46-F4-6P (cont.) | Interarytenoideus Muscle | .0719 | 1.7179 | .1880 | .7449 |
| | Thyroid Cartilage -- Height | | | 1.2995R | |
| 46-F4-11P | Thyroid Cartilage -- Height | | | 1.1614R | |

* L = left, R = right; no letter = neither L nor R is indicated.

Table B-7. Apparent Size of Structures/Specimen 4/Sagittal Plane/Left Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 68-F1-7L | Interarytenoideus Muscle | .0495 | .8900 | .2848 | .1033 |
| 68-F2-1L | Interarytenoideus Muscle | .0428 | .8404 | .2947 | .8329 |
| 68-F2-3L | Interarytenoideus Muscle | .0459 | .9125 | .3169 | .1038 |
| 68-F2-6L | Interarytenoideus Muscle | .0581 | .9788 | .2992 | .1193 |
| 68-F2-7L | Interarytenoideus Muscle | .1773 | 1.7639 | .5951 | .2457 |
| | Anterior Cricothyroid Ligament | | | .7165 | |
| 68-F3-2L | Posterior Cricoarytenoid Muscle | .4321 | 4.353 | 1.9810 | .2372 |
| | Interarytenoideus Muscle | .1630 | 1.7196 | .6144 | .2793 |
| | Thyroarytenoid Muscle | .2357 | 2.0103 | .2410 | .7152 |
| | Thyroid Cartilage | | | 1.8108 | |
| 68-F3-4L | Posterior Cricoarytenoid Muscle | .1318 | 2.9374 | 1.4187 | .0866 |
| | Interarytenoideus Muscle | .1793 | 1.9606 | .5772 | .2059 |
| | Thyroarytenoid Muscle | .6754 | 4.5848 | .3556 | 1.3031 |
| | Posterior Cricoarytenoid Ligament | | | .4594 | |
| | Thyroid Cartilage | | | 2.3446 | |
| 68-F3-7L | Posterior Cricoarytenoid Muscle | .0578 | 1.7806 | .7988 | .0780 |
| | Interarytenoideus Muscle | .0517 | 1.0700 | .3136 | .1055 |
| | Thyroarytenoid Muscle | .1712 | 2.4115 | .1829 | .6706 |
| | Posterior Cricoarytenoid Ligament | | | .3945 | |

Table B-7--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 68-F3-7L (cont.) | Thyroid Cartilage | | | 1.0239 | |
| 68-F3-9L | Posterior Cricoarytenoid Muscle | .0657 | 1.7648 | .8414 | .0916 |
| | Interarytenoideus Muscle | .0610 | 1.2134 | .4784 | .1085 |
| | Thyroarytenoid Muscle | .1721 | 2.0446 | .6399 | .2792 |
| | Posterior Cricoarytenoid Ligament | | | .3785 | |
| | Thyroid Cartilage | | | 1.2068 | |
| 68-F4-3L | Posterior Cricoarytenoid Muscle | .0932 | 1.6160 | .6677 | .1424 |
| | Interarytenoideus Muscle | .0166 | .7302 | .3086 | .0420 |
| | Thyroarytenoid Muscle | .0359 | .9992 | .0810 | .4415 |
| | Thyroid Cartilage | | | .9510 | |
| 68-F4-5L | Posterior Cricoarytenoid Muscle | .0959 | 1.6117 | .7362 | .1255 |
| | Interarytenoideus Muscle | .0221 | .7896 | .3417 | .0462 |
| | Thyroarytenoid Muscle | .0558 | 1.4561 | .6860 | .0907 |
| | Thyroid Cartilage | | | .9909 | |
| 68-F4-8L | Posterior Cricoarytenoid Muscle | .0880 | 1.8637 | .7293 | .1305 |
| | Interarytenoideus Muscle | .0102 | .6754 | .0152 | .2687 |
| | Thyroarytenoid Muscle | .0514 | 1.1416 | .1184 | .4433 |
| | Thyroid Cartilage | | | .9218 | |

Table B-7--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 68-F5-1L | Posterior Cricoarytenoid Muscle | .0468 | 1.0279 | .4040 | .1050 |
| | Lateral Cricoarytenoid Muscle | .0123 | .5366 | .0906 | .1869 |
| | Cricothyroid Muscle | .0690 | 1.3063 | .3597 | .0953 |
| | Thyroarytenoid Muscle | .0846 | 1.3717 | .1658 | .4468 |
| | Thyroid Cartilage | | | .8860 | |
| 68-F5-2L | Posterior Cricoarytenoid Muscle | .0212 | .6847 | .2662 | .0521 |
| | Lateral Cricoarytenoid Muscle | .0087 | .4292 | .0394 | .1271 |
| | Cricothyroid Muscle | .0870 | 1.5676 | .6593 | .1272 |
| | Thyroarytenoid Muscle | .0436 | .8598 | .1377 | .3597 |
| | Thyroid Cartilage | | | .9072 | |
| 68-F5-5L | Cricothyroid Muscle | .1881 | 1.6636 | .4965 | .5172 |
| | Thyroid Cartilage | | | .7418 | |
| 68-F5-7L | Cricothyroid Muscle | .1656 | 1.5977 | .3919 | .3931 |
| | Thyroid Cartilage | | | 1.1713 | |
| 68-F5-9L | Cricothyroid Muscle | .1779 | 1.7146 | .3168 | .5183 |
| | Thyroid Cartilage | | | 1.1249 | |

Table B-8. Apparent Size of Structures/Specimen 4/Sagittal Plane/Right Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 68-F6-1R | Posterior Cricoarytenoid Muscle | .0285 | .7277 | .2650 | .0831 |
| | Thyroarytenoid Muscle | .1149 | 1.4336 | .1771 | .5012 |
| | Height of TVF | | | .4631 | |
| | Thyroid Cartilage | | | .8610 | |
| 68-F6-3R | Thyroarytenoid Muscle | .1291 | 1.6192 | .2558 | .6081 |
| | Height of TVF | | | .3803 | |
| | Thyroid Cartilage | | | .9480 | |
| 68-F7-1R | Thyroarytenoid Muscle | .0942 | 1.4417 | .1571 | .5287 |
| | Height of TVF | | | .5032 | |
| | Thyroid Cartilage | | | 1.0284 | |
| 68-F7-4R | Cricothyroid Muscle | .0289 | .8556 | .3545 | .0675 |
| | Thyroarytenoid Muscle | .0874 | 1.5047 | .2434 | .4779 |
| | Height of TVF | | | .4478 | |
| | Thyroid Cartilage | | | .8895 | |
| 68-F7-7R | Posterior Cricoarytenoid Muscle | .0277 | .6718 | .2507 | .0696 |
| | Cricothyroid Muscle | .0698 | 1.6629 | .8011 | .1493 |
| | Thyroarytenoid Muscle | .0487 | .8649 | .2137 | .2536 |
| | Thyroid Cartilage | | | .9436 | |
| 68-F8-1R | Posterior Cricoarytenoid Muscle | .0642 | 1.2864 | .4503 | .0932 |
| | Lateral Cricoarytenoid Muscle | .0940 | 1.1921 | .3628 | .2443 |

Table B-8--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| 68-F8-1R (cont.) | Interarytenoideus Muscle | .0425 | 1.1795 | .5188 | .0984 |
| | Cricothyroid Muscle | .0779 | 1.5064 | .6775 | .3314 |
| | Thyroarytenoid Muscle | .0460 | .8098 | .1858 | .1665 |
| | Thyroid Cartilage | | | .9631 | |
| 68-F8-4R | Posterior Cricoarytenoid Muscle | .0717 | 1.2321 | .4847 | .1335 |
| | Lateral Cricoarytenoid Muscle | .0295 | .8147 | .1923 | .1437 |
| | Interarytenoideus Muscle | .0624 | 1.4129 | .7587 | .0870 |
| | Cricothyroid Muscle | .1831 | 1.8536 | .3061 | .5543 |
| | Thyroid Cartilage | | | .9244 | |
| 68-F8-7R | Cricothyroid Muscle | .1221 | 1.3845 | .4053 | .2317 |
| | Thyroid Cartilage | | | .9961 | |
| 68-F8-10R | Cricothyroid Muscle | .1241 | 1.3515 | .4710 | .2860 |
| 68-F8-13R | Cricothyroid Muscle | .1901 | 1.8359 | .5042 | .4923 |

Table B-9. Apparent Size of Structures/Specimen 5/Transverse Plane/Left Medial Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 62-F2-1M | Posterior Cricoarytenoid Muscle | .0058 | .4541 | .0141 | .1405 |
| 62-F2-3M | Posterior Cricoarytenoid Muscle | .0096 | .5274 | .0276 | .2162 |
| 62-F2-5M | Posterior Cricoarytenoid Muscle | .0160 | .6688 | .0451 | .2666 |
| | Lateral Cricoarytenoid Muscle | .0143 | .6651 | .1827 | .0320 |
| 62-F2-7M | Posterior Cricoarytenoid Muscle | .0225 | .7393 | .0493 | .2608 |
| | Lateral Cricoarytenoid Muscle | .0084 | .5535 | .1622 | .0226 |
| 62-F2-9M | Posterior Cricoarytenoid Muscle | .0227 | .7190 | .0748 | .2652 |
| | Lateral Cricoarytenoid Muscle | .0062 | .4439 | .1112 | .0155 |
| 62-F2-11M | Posterior Cricoarytenoid Muscle | .0397 | .9535 | .0956 | .3781 |
| | Lateral Cricoarytenoid Muscle | .0136 | .6975 | .1886 | .0133 |
| 62-F2-13M | Posterior Cricoarytenoid Muscle | .0420 | .9842 | .0686 | .3898 |
| | Lateral Cricoarytenoid Muscle | .0144 | 1.1044 | .4619 | .0290 |
| 62-F2-15M | Posterior Cricoarytenoid Muscle | .0341 | .8048 | .0717 | .2475 |
| | Lateral Cricoarytenoid Muscle | .0150 | .9551 | .3989 | .0137 |

Table B-9--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 62-F2-17M | Posterior Cricoarytenoid Muscle | .0433 | .9551 | .0745 | .3749 |
| | Lateral Cricoarytenoid Muscle | .0244 | .8588 | .3100 | .0411 |
| 62-F3-2M | Interarytenoideus Muscle | .0932 | 1.2657 | .2003 | .4230 |
| | Lateral Cricoarytenoid Muscle | .0150 | .8103 | .3901 | .0380 |
| | Posterior Cricoarytenoid Muscle | .0446 | 1.0855 | .0854 | .3811 |
| | Thyroarytenoid Muscle | .0157 | .5862 | .0790 | .1386 |
| 62-F3-5M | Interarytenoideus Muscle | .0607 | 1.1562 | .0820 | .4177 |
| | Lateral Cricoarytenoid Muscle | .0163 | .8377 | .2537 | .0269 |
| | Thyroarytenoid Muscle | .0160 | .5640 | .1166 | .1348 |
| 62-F3-8M | Posterior Cricoarytenoid Muscle | .0760 | 1.2209 | .2011 | .3641 |
| | Interarytenoideus Muscle | .0305 | .8941 | .0605 | .3622 |
| | Cricothyroid Muscle | .0760 | 1.2209 | .2076 | .5351 |
| | Thyroarytenoid Muscle | .0478 | .8976 | .2535 | .2468 |
| 62-F3-11M | Posterior Cricoarytenoid Muscle | .1009 | 1.2970 | .2449 | .4290 |
| | Cricothyroid Muscle | .0361 | 1.1687 | .4584 | .0980 |
| | Thyroarytenoid Muscle | .0489 | .8583 | .2020 | .2186 |
| 62-F3-15M | Posterior Cricoarytenoid Muscle | .0894 | 1.2260 | .1889 | .4069 |
| | Cricothyroid Muscle | .0308 | 1.0243 | .3922 | .0287 |

Table B-9--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 62-F3-15M (cont.) | Thyroarytenoid Muscle | .0557 | 1.0647 | .2301 | .1138 |
| 62-F3-18M | Cricothyroid Muscle | .0110 | .7686 | .3361 | .0233 |
| | Thyroarytenoid Muscle | .0922 | 1.7482 | .6422 | .2916 |
| 62-F4-3M | Thyroarytenoid Muscle | .0827 | 1.4783 | .6461 | .2065 |

Table B-10. Apparent Size of Structures/Specimen 5/Transverse Plane/Right Medial Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 62-F2-10M | Posterior Cricoarytenoid Muscle | .0145 | .7847 | .0591 | .3591 |
| | Interarytenoideus Muscle | .0585 | 1.0400 | .2115 | .3359 |
| 62-F2-14M | Posterior Cricoarytenoid Muscle | .0397 | 1.2562 | .0749 | .5051 |
| | Interarytenoideus Muscle | .0827 | 1.2952 | .1416 | .4848 |
| 62-F2-18M | Posterior Cricoarytenoid Muscle | .0399 | 1.1909 | .0813 | .5852 |
| | Lateral Cricoarytenoid Muscle | .0246 | .7528 | .3042 | .0648 |
| | Interarytenoideus Muscle | .0816 | 1.3716 | .5896 | .2332 |
| 62-F3-4M | Posterior Cricoarytenoid Muscle | .0537 | 1.2480 | .0673 | .5628 |
| | Lateral Cricoarytenoid Muscle | .0321 | 1.0137 | .4225 | .0598 |
| | Interarytenoideus Muscle | .0854 | 1.3716 | .2248 | .5448 |
| | Thyroarytenoid Muscle | .0618 | 1.0381 | .4014 | .1302 |
| 62-F3-8M | Posterior Cricoarytenoid Muscle | .0512 | 1.2649 | .0724 | .6040 |
| | Lateral Cricoarytenoid Muscle | .0316 | 1.0164 | .4298 | .0643 |
| | Interarytenoideus Muscle | .0952 | 1.3919 | .2488 | .5082 |
| | Thyroarytenoid Muscle | .0904 | 1.2385 | .3856 | .2549 |
| 62-F3-12M | Posterior Cricoarytenoid Muscle | .0519 | 1.2667 | .0540 | .6394 |
| | Lateral Cricoarytenoid Muscle | .0092 | .5452 | .2434 | .0348 |

Table B-10--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 62-F3-12M (cont.) | Interarytenoideus Muscle | .0900 | 1.2977 | .1981 | .5041 |
| | Thyroarytenoid Muscle | .0666 | 1.0906 | .3607 | .1465 |
| 62-F3-16M | Posterior Cricoarytenoid Muscle | .0512 | 1.1885 | .0960 | .5795 |
| | Interarytenoideus Muscle | .0943 | 1.3961 | .2515 | .5366 |
| | Thyroarytenoid Muscle | .1198 | 1.7964 | .6236 | .2418 |
| 62-F4-2M | Posterior Cricoarytenoid Muscle | .0458 | 1.1529 | .0688 | .4735 |
| | Thyroarytenoid Muscle | .0557 | 1.1424 | .3796 | .1388 |
| 62-F4-6M | Posterior Cricoarytenoid Muscle | .0480 | 1.5524 | .7461 | .0453 |
| | Thyroarytenoid Muscle | .1440 | 1.8049 | .7477 | .1486 |
| 62-F4-10M | Posterior Cricoarytenoid Muscle | .0279 | 1.0450 | .0308 | .4792 |
| | Thyroarytenoid Muscle | .1483 | 1.9740 | .8886 | .1927 |

Table B-11. Apparent Size of Structures/Specimen 6/Coronal Plane/Anterior Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-3A | Cricothyroid Muscle | .0423L<br>.0257R | 1.0559L<br>.7850R | .4241L<br>.2821R | .1644L<br>.1788R |
| | Conus Elasticus | | | .4850L<br>.4950R | |
| | Surface Width of TVF | | | | .0886L<br>.1360R |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | .8727 |
| | -- Distance between Inferior Prominences | | | | .9503 |
| | -- Height | | | 1.0979L<br>1.0200R | |
| | Vibratory Mass Measures<br>-- Height from Cricoid to TVF | | | .4531L<br>.3224R | |
| | -- Phonatory Position (glottal width/2) | | | | .0491 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2636L<br>.2722R |
| | -- Area of Vibratory Mass | .1505L<br>.1349R | 1.6719L<br>1.7276R | .5861L<br>.5781R | .2778L<br>.2757R |
| 69-F1-6A | Cricothyroid Muscle | .0361L<br>.0375R | .8898L<br>.8846R | .3675L<br>.3619R | .1618L<br>.1773R |
| | Thyroarytenoid Muscle | .0970L<br>.0616R | 1.4748L<br>1.2871R | .6581L<br>.5517R | .2606L<br>.2035R |
| | Conus Elasticus | | | .4298L<br>.4656R | |

Table B-11--continued.

| Slide # | Structure | Area (Sq.Inch) | Perimeter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-6A (cont.) | Surface Width of TVF | | | | .0856L<br>.1039R |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | .9350 |
| | -- Distance between Inferior Prominences | | | | .7585 |
| | -- Height | | | .9975L<br>1.0020R | |
| | Vibratory Mass Measures<br>-- Height from Cricoid to TVF | | | .4000L<br>.3210R | |
| | -- Phonatory Position (glottal width/2) | | | | .0435 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2405L<br>.2411R |
| | -- Area of Vibratory Mass | .1467L<br>.1280R | 1.7024L<br>1.6996R | .7069L<br>.6406R | .2443L<br>.2622R |
| 69-F1-9A | Cricothyroid Muscle | .0407L<br>.0188R | .9085L<br>.5578R | .3779L<br>.2314R | .1390L<br>.1046R |
| | Thyroarytenoid Muscle | .0884L<br>.0578R | 1.3891L<br>1.0025R | .6411L<br>.3595R | .2156L<br>.1749R |
| | Conus Elasticus | | | .5050R | |
| | Surface Width of TVF | | | | .1027L<br>.1045R |

Table B-11--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-9A (cont.) | Thyroid Cartilage -- Distance between Superior Apexes | | | | .8642 |
| | -- Distance between Inferior Prominences | | | | .6616 |
| | -- Height | | | .9866L<br>1.0183R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | | .5661L<br>.4996R |
| | -- Phonatory Position (glottal width/2) | | | | .0496 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1752L<br>.1858R |
| | -- Area of Vibratory Mass | .1068L<br>.1304R | 1.4632L<br>1.5296R | .5427L<br>.5089R | .2247L<br>.2268R |
| 69-F1-11A | Cricothyroid Muscle | .0413L<br>.0386R | .8629L<br>.9445R | .2779L<br>.3653R | .1984L<br>.0920R |
| | Thyroarytenoid Muscle | .0529L<br>.0567R | 1.2082L<br>1.1407R | .4700L<br>.4605R | .1618L<br>.1532R |
| | Surface Width of TVF | | | | .1224L<br>.1294R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .7961 |
| | -- Distance between Inferior Prominences | | | | .4373 |

Table B-11--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-11A (cont.) | Thyroid Cartilage -- Height | | | 1.0981L<br>1.0571R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .6472L<br>.6599R | |
| | -- Phonatory Position (glottal width/2) | | | | .0422 |
| | -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1699L<br>.1313R |
| | -- Area of Vibratory Mass | .1340L<br>.1649R | 2.0242L<br>2.1098R | .7109L<br>.8595R | .2117L<br>.1547R |
| 69-F1-14A | Thyroarytenoid Muscle | .0581L<br>.0422R | 1.2176L<br>1.1760R | .5511L<br>.5375R | .1658L<br>.1134R |
| | Surface Width of TVF | | | | .1248L |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .8022 |
| | -- Distance between Inferior Prominences | | | | .2930 |
| | -- Height | | | 1.1902L<br>1.1634R | |
| | Vibratory Mass Measures -- Height from Cricoid to TVF | | | .4968L<br>.5458R | |

Table B-11--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-14A (cont.) | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1518L<br>.1030R |
| | -- Area of Vibratory Mass | .0860L<br>.1257R | 1.7673L<br>1.9662R | .6670L<br>.7596R | .1542L<br>.1804R |
| 69-F1-18A | Thyroarytenoid Muscle | .0248L<br>.0262R | .7825L<br>.8543R | .3381L<br>.3210R | .1272L<br>.0722R |
| | Surface Width of TVF | | | | .1143L<br>.1203R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .6770 |
| | -- Height | | | 1.1302L<br>1.1622R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1323L<br>.1322R |
| | -- Area of Vibratory Mass | .0481L<br>.0444R | .9124L<br>.8727R | .3049L<br>.3020R | .1341L<br>.1371R |
| 69-F2-3A | Thyroarytenoid Muscle | .0117L<br>.0071R | .4923L<br>.4632R | .2081L<br>.1566R | .0608L<br>.0402R |
| | Surface Width of TVF | | | | .0791L<br>.0454R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .5754 |

Table B-11--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F2-3A (cont.) | Thyroid Cartilage -- Height | | | 1.0327L<br>.9248R | |
| | -- Height | | | .1013L<br>.0703R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1013L<br>.0703R |
| | -- Area of Vibratory Mass | .0377L<br>.0438R | .9847L<br>1.0827R | .4050L<br>.3659R | .1498L<br>.1623R |
| 69-F2-7A | Thyroarytenoid Muscle | .0091L<br>.0063R | .6005L<br>.4941R | .2796L<br>.1882R | .0443L<br>.0847R |
| | Surface Width of TVF | | | | .1312L<br>.0771R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | .6030 |
| | -- Height | | | 1.0652L<br>1.1009R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .1513L<br>.1465R |
| | -- Area of Vibratory Mass | .0218L<br>.0168R | .6277L<br>.5663R | .1611L<br>.1620R | .1621L<br>.1489R |
| 69-F2-10A | Thyroid Cartilage -- Height | | | .9674L<br>1.0363R | |

* L = left, R = right; no letter = neither L nor R is indicated.

Table B-12. Apparent Size of Structures/Specimen 6/Coronal Plane/Posterior Block

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-2P | Lateral Cricoarytenoid Muscle | .0185R | .6965R | .1577R | .2276R |
| | Cricothyroid Muscle | .0472R | 1.0663R | .4063R | .1974R |
| | Thyroarytenoid Muscle | .1022R | 1.5688R | .5638R | .3766R |
| | Conus Elasticus | | | .5098R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1672 |
| | -- Distance between Inferior Prominences | | | | 1.0454 |
| | -- Height | | | 1.1427L<br>.9682R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3766R |
| | -- Area of Vibratory Mass | .1725R | 2.0100R | .5812R | .4071R |
| 69-F1-4P | Lateral Cricoarytenoid Muscle | .0124R | .5409R | .0883R | .1424R |
| | Cricothyroid Muscle | .0428R | .9725R | .3665R | .1464R |
| | Thyroarytenoid Muscle | .0626L<br>.0878R | 1.1856L<br>1.3114R | .3766L<br>.4027R | .2166L<br>.2693R |
| | Conus Elasticus | | | .4962L<br>.4057R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.0519 |
| | -- Distance between Inferior Prominences | | | | .9038 |

Table B-12--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-4P (cont.) | Thyroid Cartilage -- Height | | | .9076L<br>.8477R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3246L<br>.3558R |
| | -- Area of Vibratory Mass | .1393L<br>.1650R | 1.7387L<br>1.7960R | .5517L<br>.4415R | .3498L<br>.3558R |
| 69-F1-7P | Lateral Cricoarytenoid Muscle | .0265R | .6778R | .1593R | .1709R |
| | Cricothyroid Muscle | .0546L<br>.0717R | 1.7088L<br>1.4901R | .7649L<br>.7311R | .1398L<br>.1264R |
| | Thyroarytenoid Muscle | .0943L<br>.0776R | 1.2069L<br>1.0273R | .3271L<br>.2211R | .3216L<br>.2745R |
| | Conus Elasticus | | | .5012L<br>.3709R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1302 |
| | -- Distance between Inferior Prominences | | | | .9197 |
| | -- Height | | | .9845L<br>.7946R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3545L<br>.3877R |

Table B-12--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-7P (cont.) | -- Area of Vibratory Mass | .1630L<br>.1287R | 1.8518L<br>1.4590R | .5286L<br>.3384R | .5006L<br>.3960R |
| 69-F1-9P | Posterior Cricoarytenoid Muscle | .0127R | .5271R | .1523R | .1274R |
| | Lateral Cricoarytenoid Muscle | .0184L<br>.0250R | .5942L<br>.5981R | .1774L<br>.1783R | .1243L<br>.1297R |
| | Cricothyroid Muscle | .0544L<br>.0407R | 1.4229L<br>1.1372R | .6149L<br>.5073R | .1108L<br>.0981R |
| | Thyroarytenoid Muscle | .0855L<br>.0430R | 1.1624L<br>.9750R | .2908L<br>.2072R | .3078L<br>.3886R |
| | Conus Elasticus | | | .3667L<br>.2841R | |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | .9925 |
| | -- Distance between Inferior Prominences | | | | .8742 |
| | -- Height | | | .8591L<br>.7325R | |
| | Vibratory Mass Measures<br>-- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2654L<br>.2974R |
| | -- Area of Vibratory Mass | .1527L<br>.1989R | 1.7791L<br>2.0116R | .5105L<br>.4738R | .3318L<br>.3112R |
| 69-F1-13P | Posterior Cricoarytenoid Muscle | .0085R | .4965R | .2889R | .0374R |

Table B-12--continued.

| Slide # | Structure | Area (Sq.Inch) | Perimeter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-13P (cont.) | Cricothyroid Muscle | .0493L<br>.0697R | 1.3687L<br>1.4686R | .6040L<br>.6230R | .0844L<br>.1000R |
| | Thyroarytenoid Muscle | .1440L<br>.0911R | 1.6525L<br>1.3250R | .4368L<br>.2666R | .3540L<br>.2842R |
| | Conus Elasticus | | | .3120L<br>.1821R | |
| | Thyroid Cartilage<br>-- Distance between Superior Apexes | | | | .9274 |
| | -- Distance between Inferior Prominences | | | | .8687 |
| | -- Height | | | .8551L<br>.7860R | |
| | Vibratory Mass Measures<br>-- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .3703L<br>.3425R |
| | -- Area of Vibratory Mass | .1847L<br>.1865R | 2.2236L<br>2.0105R | .4752L<br>.4171R | .4684L<br>.3842R |
| 69-F1-18P | Posterior Cricoarytenoid Muscle | .0019R | .1735R | .0632R | .0361R |
| | Interarytenoideus Muscle | .0824 | 1.5325 | .6664 | .1463 |
| | Cricothyroid Muscle | .0385L<br>.0194R | 1.1740L<br>.6718R | .5107L<br>.1797R | .0829L<br>.0704R |
| | Thyroarytenoid Muscle | .0440L | .9372L | .2278L | .2197L |
| | Conus Elasticus | | | .3722L<br>.1670R | |

Table B-12--continued.

| Slide # | Structure | Area (Sq.Inch) | Perimeter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F1-18P (cont.) | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1156 |
| | -- Distance between Inferior Prominences | | | | .9310 |
| | -- Height | | | .8246L<br>1.0152R | |
| | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2259L |
| | -- Area of Vibratory Mass | .0769L | 1.3278L | .2761L | .2284L |
| 69-F2-3P | Posterior Cricoarytenoid Muscle | .0116R | .6776R | .2680R | .0492R |
| | Interarytenoideus Muscle | .0812 | 1.4533 | .1294 | .5563 |
| | Cricothyroid Muscle | .0395L<br>.0368R | 1.2494L<br>1.2353R | .5163L<br>.4214R | .1039L<br>.0647R |
| | Thyroarytenoid Muscle | .0340L<br>.0257R | .8465L<br>.7607R | .2457L<br>.1025R | .2336L<br>.2301R |
| | Conus Elasticus | | | .2258L<br>.1003R | |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.0556 |
| | -- Distance between Inferior Prominences | | | | 1.0116 |
| | -- Height | | | .7179L<br>1.0053R | |

Table B-12--continued.

| Slide # | Structure | Area (Sq.Inch) | Perimeter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F2-3P (cont.) | Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | | | | .2497L<br>.1874R |
| | -- Area of Vibratory Mass | .0768L | 1.2560L | .2480L | .3079L |
| 69-F2-6P | Posterior Cricoarytenoid Muscle | .0103L<br>.0154R | .4830L<br>.5618R | .1873L<br>.2439R | .0721L<br>.0813R |
| | Interarytenoideus Muscle | .0665 | 1.4223 | .1470 | .6689 |
| | Cricothyroid Muscle | .0226L<br>.0320R | .9795L<br>.9225R | .4768L<br>.3552R | .1005L<br>.0933R |
| | Thyroarytenoid Muscle | .0267R | .7566R | .2215R | .2202R |
| | Thyroid Cartilage -- Distance between Superior Apexes | | | | 1.1492 |
| | -- Distance between Inferior Prominences | | | | 1.0263 |
| | -- Height | | | 1.2155R | |
| 69-F2-10P | Posterior Cricoarytenoid Muscle | .0182L<br>.0453R | .5877L<br>1.2600R | .1988L<br>.5153R | .0847L<br>.1030R |
| | Cricothyroid Muscle | .0253L<br>.0949R | .9155L<br>2.0353R | .3621L<br>.6819R | .0865L<br>.1945R |
| | Thyroid Cartilage -- Distance between Inferior Prominences | | | | 1.0663 |
| | -- Height | | | .3500R | |

Table B-12--continued.

| Slide # | Structure | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| 69-F2-15P | Posterior Cricoarytenoid Muscle | .0207L<br>.0343R | .6591L<br>1.1502R | .2227L<br>.4287R | .0828L<br>.0591R |
| | Interarytenoideus Muscle | .0117 | 1.3473 | .0565 | .5235 |
| | Cricothyroid Muscle | .0371L | 1.0632L | .3877L | .0754L |
| 69-F2-18P | Posterior Cricoarytenoid Muscle | .0169L<br>.0507R | .5623L<br>1.3550R | .1866L<br>.5274R | .0788L<br>.0707R |
| | Cricothyroid Muscle | .0266L | .8715L | .2922L | .0657L |
| 69-F3-3P | Posterior Cricoarytenoid Muscle | .0431R | 1.3322R | .7255R | .0525R |

* L = left, R = right; no letter = neither L nor R is indicated.

# APPENDIX C
# APPARENT SIZE OF STRUCTURES
# ARRANGED BY STRUCTURE ACROSS SLIDES

Table C-1. Apparent Size of Structures/Specimen 1/Sagittal Plane/Left Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 75-F2-14L | .3260 | 2.6021 | .3953 | 1.0607 |
| | 75-F3-1L | .2912 | 2.4133 | .6381 | .4925 |
| Interarytenoideus Muscle | 75-F1-5L | .0707 | 1.1431 | .3068 | .2682 |
| | 75-F1-9L | .0684 | 1.2454 | .2647 | .2664 |
| | 75-F1-13L | .0645 | 1.1818 | .3184 | .1771 |
| | 75-F1-18L | .0560 | 1.1498 | .4497 | .0619 |
| | 75-F2-5L | .0127 | .5903 | .1846 | .0216 |
| Lateral Cricoarytenoid Muscle | 75-F2-14L | .0497 | 1.1466 | .2128 | .3146 |
| Posterior Cricoarytenoid Muscle | 75-F1-9L | .0332 | 1.0662 | .3837 | .0565 |
| | 75-F1-13L | .0718 | 1.2962 | .4913 | .0689 |
| | 75-F1-18L | .0711 | 1.5063 | .6244 | .1040 |
| | 75-F2-5L | .0710 | 1.3485 | .5375 | .1034 |
| | 75-F2-9L | .0753 | 1.4958 | .6256 | .1011 |
| | 75-F2-14L | .0626 | 1.5335 | .6680 | .1079 |
| | 75-F3-1L | .0464 | .9284 | .3931 | .1044 |
| Thyroarytenoid Muscle | 75-F1-13L | .0461 | .8798 | .3342 | .1285 |
| | 75-F1-18L | .1093 | 1.2671 | .2326 | .4155 |
| | 75-F2-5L | .3625 | 2.6789 | .2630 | 1.0387 |
| | 75-F2-9L | .5553 | 2.9600 | .5425 | 1.1944 |
| | 75-F2-14L | .3379 | 2.3723 | .7633 | .4423 |

Table C-1--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Thyroartenoid Muscle (cont.) | 75-F3-1L | .0723 | 1.2612 | .2320 | .4319 |
| | 75-F3-5L | .2114 | 2.0595 | .3273 | .7110 |
| | 75-F3-10L | .1304 | 1.9755 | .1641 | .6557 |
| | 75-F3-14L | .2928 | 2.6509 | .4667 | .7022 |
| Conus Elasticus -- Cricothyroid Ligament | 75-F2-14L | | | .3567 | |
| Posterior Cricoarytenoid Ligament | 75-F1-13L | | | .2190 | |
| | 75-F1-18L | | | .2091 | |
| | 75-F2-5L | | | .0629 | |
| | 75-F2-9L | | | .1099 | |

Table C-2. Apparent Size of Structures/Specimen 1/Sagittal Plane/Right Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 75-F2-9R | .0511 | 1.2982 | .5173 | .0828 |
| | 75-F2-13R | .0745 | 1.2826 | .4429 | .1122 |
| | 75-F2-18R | .0531 | 1.0358 | .3938 | .1174 |
| | 75-F3-6R | .0671 | 1.0945 | .3199 | .1495 |
| | 75-F3-13R | .0605 | 1.2089 | .4766 | .1551 |
| | 75-F3-17R | .0978 | 1.5023 | .6228 | .1260 |
| Interarytenoideus Muscle | 75-F2-18R | .0346 | 1.0269 | .4081 | .0629 |
| | 75-F3-6R | .0324 | .9207 | .3433 | .0300 |
| | 75-F3-9R | .0258 | 1.1329 | .4390 | .0446 |
| | 75-F3-13R | .0725 | 1.2628 | .4163 | .1019 |
| | 75-F3-17R | .0214 | .6236 | .1524 | .0650 |
| Lateral Cricoarytenoid Muscle | 75-F1-14R | .0381 | .8314 | .2240 | .0606 |
| | 75-F1-18R | .0087 | .4817 | .0866 | .0932 |
| | 75-F2-3R | .0368 | 1.0733 | .2972 | .2483 |
| Posterior Cricoarytenoid Muscle | 75-F1-10R | .0468 | .8388 | .2694 | .1151 |
| | 75-F1-14R | .0528 | .9230 | .2926 | .1077 |
| | 75-F1-18R | .0395 | .8420 | .2545 | .1254 |
| | 75-F2-3R | .0439 | .8940 | .3089 | .1116 |
| | 75-F2-9R | .0489 | .9773 | .2760 | .1361 |
| | 75-F2-13R | .0211 | .6673 | .1951 | .0819 |
| | 75-F2-18R | .0859 | 1.8817 | .7122 | .1023 |

Table C-2--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Posterior Cricoarytenoid Muscle (cont.) | 75-F3-6R | .0749 | 1.4190 | .6045 | .1129 |
| | 75-F3-9R | .0972 | 1.6961 | .6931 | .1149 |
| | 75-F3-13R | .0672 | 1.2091 | .4379 | .1514 |
| | 75-F3-17R | .0784 | 1.4652 | .5421 | .0909 |
| Thyroarytenoid Muscle | 75-F1-7R | .1318 | 2.0219 | .2949 | .6773 |
| | 75-F1-10R | .2292 | 2.4642 | .3717 | .9157 |
| | 75-F1-14R | .2855 | 2.5105 | .4953 | .7123 |
| | 75-F1-18R | .2517 | 2.5753 | .3719 | .7938 |
| | 75-F2-3R | .2595 | 2.5892 | .3084 | .6724 |
| | 75-F2-9R | .2747 | 1.999 | .4168 | .5179 |
| | 75-F2-13R | .3309 | 2.2542 | .6543 | .4656 |
| | 75-F2-18R | .0741 | 1.4425 | .1536 | .4873 |
| | 75-F3-6R | .1499 | 1.7387 | .1725 | .6242 |
| | 75-F3-9R | .0902 | 1.3978 | .4474 | .1639 |
| | 75-F3-13R | .0747 | 1.1475 | .2457 | .3353 |
| | 75-F3-17R | .0626 | .9493 | .1428 | .2108 |
| Anterior Cricoarytenoid Ligament | 75-F1-18R | .5944 | | | |
| | 75-F2-3R | .6189 | | | |
| | 75-F2-9R | .3941 | | | |
| | 75-F2-18R | .7455 | | | |

Table C-2--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Anterior Cricoarytenoid Ligament (cont.) | 75-F3-6R | .5145 | | | |
| | 75-F3-13R | .0733 | | | |
| Posterior Cricoarytenoid Ligament | 75-F3-13R | .0640 | | | |
| Thyroid Cartilage | 75-F1-10R | | | 1.0628 | |
| | 75-F1-14R | | | 1.1093 | |
| | 75-F1-18R | | | 1.0378 | |
| | 75-F2-3R | | | .9614 | |
| | 75-F2-9R | | | .9306 | |
| | 75-F2-13R | | | 1.0544 | |
| | 75-F2-18R | | | .7618 | |
| | 75-F3-6R | | | .9296 | |
| | 75-F3-9R | | | .9534 | |
| | 75-F3-13R | | | .8256 | |
| | 75-F3-17R | | | .8343 | |
| | 75-F4-3R | | | .9030 | |
| | 75-F4-6R | | | 1.1037 | |

Table C-3. Apparent Size of Structures/Specimen 2/Transverse Plane/Superior Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Lateral-Medial (Inch) |
|---|---|---|---|---|---|
| Interarytenoideus Muscle | 48-F1-1S | .1064L* | 1.8258L | .6315L | .1581L |
| | | .0760R | 1.6346R | .6567R | .1489R |
| | 48-F1-11S | .0641 | 1.5353 | .1575 | .5488 |
| | 48-F1-13S | .1213 | 1.8233 | .1381 | .7961 |
| | 48-F1-15S | .0955 | 1.6081 | .1082 | .6586 |
| | 48-F2-1S | .0873 | 1.6997 | .0909 | .7681 |
| | 48-F2-3S | .0597 | 1.5798 | .0721 | .6667 |
| | 48-F2-5S | .0432 | 1.4788 | .0930 | .6529 |
| Lateral Cricoarytenoid Muscle | 48-F1-1S | .0345R | 1.5641R | .6469R | .0444R |
| | 48-F1-3S | .0330L | 1.6164L | .6423L | .0621L |
| | | .0402R | 1.4805R | .6240R | .0344R |
| | 48-F1-5S | .0570L | 1.4869L | .6105L | .0855L |
| | | .0480R | 1.5244R | .6782R | .0499R |
| | 48-F1-7S | .1457L | 2.2453L | 1.0320L | .1370L |
| | | .0897R | 1.7136R | .7249R | .1619R |
| Posterior Cricoarytenoid Muscle | 48-F1-1S | .0320L | 1.0162L | .1025L | .3930L |
| | | .0197R | .7225R | .0767R | .2932R |
| | 48-F1-3S | .0255L | .7777L | .0713L | .2946L |
| | | .0090R | .4071R | .0544R | .2177R |
| | 48-F1-5S | .0170L | .7776L | .0524L | .3097L |
| | | .0060R | .4200R | .0359R | .1717R |
| | 48-F1-7S | .0092L | .6432L | .0189L | .2546L |
| | | .0020R | .2769R | .0142R | .1242R |
| | 48-F1-9S | .0075L | .5468L | .0211L | .2009L |

Table C-3--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Lateral-Medial (Inch) |
|---|---|---|---|---|---|
| Thyroarytenoid Muscle | 48-F1-3S | .0964L | 1.9906L | .8567L | .1750L |
| | | .1040R | 1.7785R | .6959R | .1242R |
| | 48-F1-5S | .2059L | 2.5773L | .8108L | .2413L |
| | | .1620R | 2.1371R | .8737R | .1773R |
| | 48-F1-7S | .0906L | 2.4542L | 1.0513L | .1072L |
| | | .0682R | 1.4426R | .5567R | .1351R |
| | 48-F1-9S | .1448L | 2.1263L | .8937L | .2528L |
| | | .1629R | 1.9569R | .7534R | .1991R |
| | 48-F1-11S | .2008L | 2.4097L | .8879L | .2327L |
| | | .1700R | 1.9276R | .7193R | .1691R |
| | 48-F1-13S | .1529L | 2.8661L | .7762L | .2527L |
| | | .1054R | 1.9985R | .9418R | .1583R |
| | 48-F1-15S | .1034L | 2.1327L | .8983L | .2468L |
| | | .0835R | 1.8802R | .7590R | .1946R |
| | 48-F2-1S | .1179L | 2.2061L | .7507L | .1385L |
| | | .1266R | 2.1804R | .8851R | .1336R |
| | 48-F2-3S | .0996L | 1.7850L | .6382L | .1225L |
| | | .1087R | 1.8041R | .6907R | .1489R |
| | 48-F2-5S | .1378L | 2.2892L | .9084L | .1250L |
| | | .0802R | 1.8075R | .8836R | .0832R |
| | 48-F2-7S | .1390L | 2.1711L | .9096L | .1854L |
| | | .1487R | 2.1528R | .8257R | .1155R |
| | 48-F2-9S | .0950L | 2.0835L | .7782L | .1755L |
| | | .0719R | 1.5469R | .6469R | .0931R |
| | 48-F2-11S | .0518L | 1.1320L | .4329L | .1263L |
| | | .0812R | 1.3308R | .4815R | .1596R |
| Posterior Cricoarytenoid Ligament | 48-F1-11S | .0520 | 1.3507 | .2008 | .3505 |

* L = left, R = right; no letter = neither L nor R is indicated.

Table C-4. Apparent Size of Structures/Specimen 2/Transverse Plane/Medial Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Lateral-Medial (Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 48-F1-4M | .0951L* | 1.9443L | .7280L | .1401L |
| | | .0557R | 1.6339R | .7107R | .1087R |
| | 48-F1-6M | .1165L | 1.9706L | .8813L | .1294L |
| | 48-F1-8M | .0744L | 1.9001L | .7335L | .0680L |
| | 48-F1-10M | .0945L | 2.3980L | .8588L | .0808L |
| | | .0341R | 1.8636R | .9708R | .0417R |
| | 48-F1-12M | .0758L | 2.2403L | .9797L | .0558L |
| | | .0499R | 2.0943R | .9150R | .0364R |
| | 48-F1-14M | .0876L | 2.3492L | 1.1252L | .0515L |
| | | .0216R | 1.2152R | .4292R | .0174R |
| | 48-F1-16M | .0599L | 2.1333L | .8408L | .0388L |
| | | .0181R | 1.1947R | .5432R | .0512R |
| | 48-F1-18M | .0534L | 1.7257L | .6689L | .0505L |
| | | .0382R | 1.6771R | .0993R | .7622R |
| | 48-F2-2M | .0442L | 1.6849L | .6191L | .0633L |
| | | .0368R | 1.8994R | .8610R | .0744R |
| | 48-F2-4M | .0504L | 1.5878L | .5061L | .0423L |
| | | .0654R | 2.1769R | .3238R | .0685R |
| Lateral Cricoarytenoid Muscle | 48-F1-2M | .0282L | 1.1542L | .3064L | .0321L |
| | | .0124R | .7009R | .2680R | .0485R |
| | 48-F1-4M | .0316L | 1.1355L | .5790L | .0707L |
| | | .0418R | 1.1833R | .3971R | .2564R |
| | 48-F1-6M | .0317L | 1.1873L | .5499L | .1168L |
| | | .0320R | 1.2678R | .4924R | .1328R |
| | 48-F1-8M | .0277L | .9813L | .3376L | .0784L |
| | | .0267R | 1.1356R | .4038R | .0655R |

Table C-4--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Lateral-Medial (Inch) |
|---|---|---|---|---|---|
| Lateral Cricoarytenoid Muscle (cont.) | 48-F1-10M | .0221L | .9665L | .3392L | .0673L |
| | 48-F1-12M | .0405L | 1.1063L | .3854L | .1163L |
| | 48-F1-14M | .0372L | .9768L | .3903L | .1454L |
| | 48-F1-16M | .0290L | .8346L | .3131L | .1355L |
| | 48-F1-18M | .0259L | .7413L | .1990L | .1191L |
| | 48-F2-2M | .0184L | .7077L | .1642L | .0712L |
| | 48-F2-4M | .0320L | 1.0130L | .3191L | .0938L |
| Posterior Cricoarytenoid Muscle | 48-F1-2M | .0466L* | 1.1083L | .1314L | .4178L |
| | | .0279R | .8675R | .0664R | .3010R |
| | 48-F1-4M | .0540L | 1.3120L | .1415L | .6152L |
| | | .0394R | 1.1178R | .1263R | .4763R |
| | 48-F1-6M | .0481L | 1.1443L | .1418L | .5226L |
| | | .0366R | 1.0786R | .1202R | .4642R |
| | 48-F1-8M | .0277L | .8981L | .0741L | .3691L |
| | | .0279R | .8293R | .0580R | .3159R |
| | 48-F1-10M | .0319L | .9922L | .0616L | .3884L |
| | | .0204R | .7256R | .0954R | .2921R |
| | 48-F1-12M | .0386L | 1.1756L | .1067L | .4907L |
| | | .0309R | 1.1624R | .0361R | .5470R |
| | 48-F1-14M | .0292L | 1.0321L | .1147L | .4699L |
| | | .0297R | 1.2766R | .0285R | .5856R |
| | 48-F1-16M | .0224L | .9535L | .0817L | .3226L |
| | | .0191R | 1.1222R | .0274R | .5717R |

Table C-4--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Lateral-Medial (Inch) |
|---|---|---|---|---|---|
| Posterior Cricoarytenoid Muscle (cont.) | 48-F1-18M | .0252L<br>.0195R | .9875L<br>1.0592R | .0418L<br>.0238R | .3616L<br>.3796R |
| | 48-F2-2M | .0241L<br>.0121R | 1.0599L<br>.9365R | .0628L<br>.0161R | .3658L<br>.3215R |
| | 48-F2-4M | .0198L<br>.0116R | .9567L<br>.7490R | .4076L<br>.3073R | .0616L<br>.0140R |
| Thyroarytenoid Muscle | 48-F1-2M | .0357L | 1.1863L | .4688L | .0552L |

* L = left, R = right; no letter = neither L nor R is indicated.

Table C-5. Apparent Size of Structures/Specimen 3/Coronal Plane/Anterior Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 46-F1-4A | .0908L* | 1.5171L | .6043L | .2764L |
| | 46-F1-8A | .0794L | 1.4152L | .5114L | .1684L |
| | 46-F1-11A | .0828L | 1.2800L | .5131L | .1669L |
| | 46-F1-14A | .0829L | 1.4870L | .5604L | .1924L |
| | 46-F2-1A | .0412L | .9792L | .3256L | .1243L |
| | 46-F2-6A | .0219L | .8010L | .3072L | .0976L |
| | 46-F2-13A | .0295L | .8304L | .3870L | .0931L |
| | 46-F3-5A | .0288L<br>.0154R | .6632L<br>.5228R | .1771L<br>.1491R | .1231L<br>.0742R |
| | 46-F3-9A | .0248L<br>.0104R | .5790L<br>.4595R | .1228L<br>.1169R | .1313L<br>.0663R |
| Lateral Cricoarytenoid Muscle | 46-F2-1A | .0057L | .3071L | .0846L | .0736L |
| | 46-F2-6A | .0137L | .4907L | .1605L | .1544L |
| | 46-F2-13A | .0170L | .5369L | .1573L | .1123L |
| Thyroarytenoid Muscle | 46-F1-4A | .0646L<br>.0172R | 1.2746L<br>.6164R | .4120L<br>.2143R | .5223L<br>.1261R |
| | 46-F1-8A | .0984L<br>.0608R | 1.2688L<br>1.1227R | .3064L<br>.3632R | .2287L<br>.1768R |
| | 46-F1-11A | .0776L<br>.0690R | 1.1051L<br>1.0829R | .3325L<br>.3823R | .2914L<br>.1982R |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroarytenoid Muscle (cont.) | 46-F1-14A | .0831L<br>.0537R | 1.2322L<br>1.0832R | .3168L<br>.3600R | .2833L<br>.1873R |
| | 46-F2-1A | .0687L<br>.0604R | 1.0864L<br>1.1418R | .3312L<br>.4266R | .2587L<br>.2246R |
| | 46-F2-6A | .0633L<br>.0449R | .9813L<br>1.2506R | .2964L<br>1.5469R | .2549L<br>.1903R |
| | 46-F2-13A | .0462L<br>.0343R | .9206L<br>.7473R | .3387L<br>.2811R | .2732L<br>.1597R |
| | 46-F2-18A | .0567L<br>.0304R | .9853L<br>.8816R | .2903L<br>.3545R | .1476L<br>.1389R |
| (Thyromuscularis) | 46-F3-5A | .0294L<br>.0179R | .8176L<br>.6546R | .2998L<br>.2903R | .0898L<br>.0510R |
| | 46-F3-9A | .0184L<br>.0205R | .6306L<br>.7587R | .2201L<br>.2754R | .0440L<br>.1577R |
| (Thyrovocalis Muscle) | 46-F3-5A | | | .3465L<br>.2925R | .1185L<br>.0864R |
| Conus Elasticus | 46-F1-4A | | | .4542L<br>.5153R | |
| | 46-F1-8A | | | .4764L<br>.5311R | |
| | 46-F1-11A | | | .4716L<br>.5591R | |
| | 46-F1-14A | | | .4869L<br>.5497R | |
| | 46-F2-1A | | | .4998L<br>.5140R | |
| | 46-F2-6A | | | .5855L<br>.5341R | |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Conus Elasticus (cont.) | 46-F2-13A | | | .4976R | |
| | 46-F2-18A | | | .6277L<br>.6235R | |
| Surface Width of TVF | 46-F1-4A | | | | .2002L<br>.1925R |
| | 46-F1-8A | | | | .1908L<br>.1868R |
| | 46-F1-11A | | | | .1489L<br>.1563R |
| | 46-F1-14A | | | | .1997L<br>.1908R |
| | 46-F2-1A | | | | .1731L<br>.1090R |
| | 46-F2-6A | | | | .2057L<br>.2380R |
| | 46-F2-18A | | | | .1885L<br>.1923R |
| | 46-F3-5A | | | | .1683L<br>.1910R |
| | 46-F3-9A | | | | .1431L<br>.1760R |
| Thyroid Cartilage -- Distance between Superior Apexes | 46-F1-4A | | | | 1.1285 |
| | 46-F1-8A | | | | 1.0641 |
| | 46-F1-11A | | | | 1.1126 |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage -- Distance between Superior Apexes (cont.) | 46-F1-14A | | | | 1.1497 |
| | 46-F2-1A | | | | 1.0305 |
| | 46-F2-6A | | | | .9390 |
| | 46-F2-13A | | | | .7440 |
| | 46-F2-18A | | | | .5776 |
| | 46-F3-5A | | | | .4799 |
| | 46-F3-9A | | | | .4235 |
| | 46-F3-14A | | | | .4123 |
| | 46-F4-2A | | | | .3962 |
| | 46-F4-7A | | | | .3595 |
| | 46-F4-12A | | | | .3856 |
| -- Distance between Inferior Prominences | 46-F1-4A | | | | 1.2552 |
| | 46-F1-8A | | | | 1.2651 |
| | 46-F1-11A | | | | 1.2332 |
| | 46-F1-14A | | | | 1.3148 |
| | 46-F2-1A | | | | 1.1919 |
| | 46-F2-6A | | | | 1.1598 |
| | 46-F2-13A | | | | .8972 |
| | 46-F2-18A | | | | .6686 |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage | | | | | |
| -- Distance between Inferior Prominences (cont.) | 46-F3-5A | | | | .4602 |
| | 46-F3-9A | | | | .3993 |
| | 46-F3-14A | | | | .3175 |
| | 46-F4-2A | | | | .1519 |
| | 46-F4-7A | | | | .2040 |
| | 46-F4-12A | | | | .1908 |
| -- Height | 46-F1-4A | | | 1.2024L<br>1.2296R | |
| | 46-F1-8A | | | 1.1018L<br>1.0777R | |
| | 46-F1-11A | | | 1.2295L<br>1.1238R | |
| | 46-F1-14A | | | 1.2341L<br>1.0196R | |
| | 46-F2-1A | | | 1.3601L<br>1.1250R | |
| | 46-F2-6A | | | 1.3680L<br>1.1036R | |
| | 46-F2-13A | | | 1.2130L<br>1.0039R | |
| | 46-F2-18A | | | 1.2609L<br>1.0358R | |
| | 46-F3-5A | | | 1.1228L<br>.9953R | |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage -- Height (cont.) | 46-F3-9A | | | 1.0588L<br>.9675R | |
| | 46-F3-14A | | | 1.0165L<br>.9474R | |
| | 46-F4-2A | | | .9398L<br>.9642R | |
| | 46-F4-7A | | | .7190L<br>.6855R | |
| | 46-F4-12A | | | .7071L<br>.7077R | |
| Vibratory Mass Measures -- Height from Cricoid to TVF | 46-F1-4A | | | .3476L<br>.4152R | |
| | 46-F1-8A | | | .3535L<br>.4210R | |
| | 46-F1-11A | | | .2961L<br>.3691R | |
| | 46-F1-14A | | | .3546L<br>.4081R | |
| | 46-F2-1A | | | .4183L<br>.5035R | |
| | 46-F2-6A | | | .4220L<br>.5214R | |
| | 46-F2-13A | | | .5190L<br>.5857R | |
| | 46-F2-18A | | | .6422L<br>.6880R | |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Vibratory Mass Measures -- Height from Cricoid to TVF (cont.) | 46-F3-5A | | | .6247L<br>.7314R | |
| | 46-F3-9A | | | .6906L<br>.7041R | |
| | 46-F3-14A | | | .1656L<br>.1488R | |
| -- Phonatory Position (glottal width/2) | 46-F1-4A | | | | .0878 |
| | 46-F1-8A | | | | .0667 |
| | 46-F1-11A | | | | .0886 |
| | 46-F1-14A | | | | .0926 |
| | 46-F2-1A | | | | .0893 |
| | 46-F2-6A | | | | .0710 |
| | 46-F2-18A | | | | .0127 |
| | 46-F3-5A | | | | .0140 |
| | 46-F3-9A | | | | .0006 |
| | 46-F3-14A | | | | .0060 |
| -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | 46-F1-4A | | | | .3186L<br>.2229R |
| | 46-F1-8A | | | | .3201L<br>.2064R |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage (cont.) | 46-F1-11A | | | | .3009L<br>.2470R |
| | 46-F1-14A | | | | .2947L<br>.2206R |
| | 46-F2-1A | | | | .2722L<br>.1851R |
| | 46-F2-6A | | | | .2666L<br>.1685R |
| | 46-F2-13A | | | | .2372L<br>.1584R |
| | 46-F2-18A | | | | .1608L<br>.0670R |
| | 46-F3-5A | | | | .0769L<br>.0628R |
| | 46-F3-9A | | | | .0440L<br>.1577R |
| -- Area of Vibratory Mass | 46-F1-4A | .1898L | 1.8356L | .4141L<br>.2924L | .5136L<br>.3926L |
| | | .1388R | 1.4779R | .3934R | .2554R |
| | 46-F1-8A | .1651L<br>.1384R | 1.5717L<br>1.4454R | .3560L<br>.4099R | .3683L<br>.2742R |
| | 46-F1-11A | .1185L<br>.1360R | 1.2637L<br>1.4678R | .3550L<br>.3487R | .3378L<br>.2649R |
| | 46-F1-14A | .1518L<br>.1534R | 1.5276L<br>1.5675R | .4133L<br>.5933R | .3516L<br>.2491R |

Table C-5--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Vibratory Mass Measures -- Area of Vibratory Mass (cont.) | 46-F2-1A | .1402L<br>.1553R | 1.4667L<br>1.7744R | .4280L<br>.6815R | .3187L<br>.2117R |
| | 46-F2-6A | .1506L<br>.1063R | 1.7656L<br>1.3258R | .4801L<br>.5412R | .3004L<br>.2147R |
| | 46-F2-18A | .1048L<br>.0768R | 1.3948L<br>1.2301R | .4701L<br>.4454R | .2195L<br>.1356R |
| | 46-F3-5A | .0502L<br>.0633R | .9391L<br>.12287R | .3079L<br>.3050R | .1294L<br>.1161R |
| | 46-F3-9A | .0458L<br>.0383R | .9668L<br>.9387R | .2947L<br>.3000R | .1682L<br>.1577R |

* L = left, R = right; no letter = neither L nor R is indicated.

Table C-6. Apparent Size of Structures/Specimen 3/Coronal Plane/Posterior Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 46-F1-3P | .0458L* | .9319L | .3385L | .0982L |
| | | .0491R | 1.0776R | .3490R | .1036R |
| | 46-F1-9P | .0379L | .8679L | .3592L | .1145L |
| | | .0545R | 1.2233R | .5716R | .1491R |
| | 46-F1-14P | .0493L | 1.2822L | .4014L | .2366L |
| | | .0874R | 1.4708R | .6906R | .2346R |
| | 46-F2-1P | .0645R | 1.3436R | .5986R | .1585R |
| | 46-F2-6P | .0600R | 1.3137R | .5853R | .2284R |
| | 46-F2-11P | .0573R | 1.1898R | .5385R | .2024R |
| | 46-F2-16P | .0637R | 1.3206R | .6024R | .2009R |
| | 46-F3-4P | .0527R | 1.2340R | .5602R | .1599R |
| | 46-F3-9P | .0274R | 1.0486R | .3774R | .1290R |
| | 46-F3-14P | .0226R | 1.1492R | .1737R | .1301R |
| Interarytenoideus Muscle | 46-F2-16P | .0776 | 1.7639 | .3120 | .2592 |
| | 46-F3-4P | .1340 | 1.7089 | .3489 | .6986 |
| | 46-F3-9P | .1096 | 1.6641 | .2559 | .6781 |
| | 46-F3-14P | .1031 | 1.4920 | .3221 | .5809 |
| | 46-F4-6P | .0719 | 1.7179 | .1880 | .7449 |
| Lateral Cricoarytenoid Muscle | 46-F1-14P | .0280L | .7091L | .3240L | .1757L |
| | | .0420R | .8419R | .2482R | .2527R |
| | 46-F2-1P | .0597R | 1.0220R | .2618R | .3296R |
| | 46-F2-6P | .0211R | .7150R | .1880R | .1836R |

Table C-6--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Lateral Cricoarytenoid Muscle (cont.) | 46-F2-11P | .0232R | .7393R | .2003R | .1538R |
| | 46-F2-16P | .0208R | .5632R | .1742R | .1839R |
| Posterior Cricoarytenoid Muscle | 46-F1-14P | .0206L | .6157L | .1877L | .1700L |
| | 46-F2-1P | .0224L | .6647L | .2776L | .1189L |
| | 46-F2-6P | .0114L | .4692L | .1849L | .0781L |
| | 46-F2-11P | .0276L | .9311L | .4446L | .0999L |
| | 46-F2-16P | .0465L | 1.1882L | .5848L | .0968L |
| | 46-F3-4P | .0627L<br>.0208R | 1.5894L<br>.6511R | .8020L<br>.2971R | .1249L<br>.0980R |
| | 46-F3-9P | .0805L<br>.0190R | 1.9273L<br>.5728R | .9157L<br>.2407R | .1144L<br>.1043R |
| | 46-F3-14P | .0754L<br>.0069R | 1.8037L<br>.5042R | .8635L<br>.2408R | .1321L<br>.0452R |
| | 46-F4-6P | .0431L<br>.0300R | 1.4604L<br>1.0539R | .6523L<br>.4636R | .0993L<br>.0656R |
| Thyroarytenoid Muscle | 46-F1-3P | .1157L<br>.1004R | 1.3751L<br>1.3007R | .3095L<br>.4257R | .3482L<br>.2123R |
| | 46-F1-9P | .0614<br>.0854R | 1.1498<br>1.2700R | .2413<br>.2510R | .2704<br>.2872R |
| | 46-F1-14P | .0800L<br>.1425R | 1.3600L<br>1.6227R | .2111L<br>.4342R | .3331L<br>.3659R |
| | 46-F2-1P | .2169R | 1.8345R | .5997R | .5212R |
| | 46-F2-6P | .0610R | 1.1619R | .2981R | .2892R |

Table C-6--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroarytenoid Muscle (cont.) | 46-F2-11P | .0581R | 1.4657R | .2459R | .3140R |
| | 46-F2-16P | .0414R | .8371R | .2948R | .2300R |
| Conus Elasticus | 46-F1-3P | | | .4653L | .3877R |
| | 46-F1-9P | | | .3438R | |
| | 46-F1-14P | | | .3137R | |
| | 46-F2-1P | | | .2040R | |
| | 46-F2-6P | | | .2064R | |
| | 46-F2-11P | | | .1763R | |
| Surface Width of TVF | 46-F1-3P | | | | .0890R |
| Thyroid Cartilage -- Distance between Superior Apexes | 46-F1-3P | | | | 1.6395 |
| | 46-F1-9P | | | | 1.7539 |
| | 46-F1-14P | | | | 1.7439 |
| | 46-F2-1P | | | | 1.5532 |
| | 46-F2-6P | | | | 1.5327 |
| | 46-F2-11P | | | | 1.5598 |
| | 46-F2-16P | | | | 1.7542 |
| | 46-F3-4P | | | | 1.8488 |
| | 46-F3-9P | | | | 1.8120 |
| | 46-F3-14P | | | | 1.7285 |

Table C-6--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage (cont.) | | | | | |
| -- Distance between Inferior Prominences | 46-F1-3P | | | | 1.5893 |
| | 46-F1-9P | | | | 1.6197 |
| | 46-F1-14P | | | | 1.5995 |
| | 46-F2-1P | | | | 1.2922 |
| | 46-F2-6P | | | | 1.2827 |
| | 46-F2-11P | | | | 1.2531 |
| | 46-F2-16P | | | | 1.2983 |
| | 46-F3-4P | | | | 1.2735 |
| | 46-F3-9P | | | | 1.3809 |
| -- Height | 46-F1-3P | | | 1.5106L<br>1.3498R | |
| | 46-F1-9P | | | .7042L<br>1.5368R | |
| | 46-F1-14P | | | 1.2618L<br>1.5103R | |
| | 46-F2-1P | | | 1.3136L<br>.8739R | |
| | 46-F2-6P | | | 1.3113L<br>1.0926R | |
| | 46-F2-11P | | | 1.2664L<br>1.0713R | |
| | 46-F2-16P | | | 1.3072L<br>1.1630R | |

Table C-6--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage (cont.) | | | | | |
| -- Height | 46-F3-4P | | | .8954L<br>1.0996R | |
| | 46-F3-9P | | | .6944L<br>1.1018R | |
| | 46-F3-14P | | | 1.1483R | |
| | 46-F4-6P | | | 1.2995R | |
| | 46-F4-11P | | | 1.1614R | |
| Vibratory Mass Measures<br>-- Height from Cricoid to TVF | 46-F1-3P | | | .3419R | |
| | 46-F1-9P | | | .2797R | |
| -- Phonatory Position (glottal width/2) | 46-F1-3P | | | | .0609 |
| | 46-F1-9P | | | | .0713 |
| | 46-F1-14P | | | | .0837 |
| | 46-F2-1P | | | | .0794 |
| | 46-F2-6P | | | | .0853 |
| | 46-F2-11P | | | | .0652 |
| | 46-F2-16P | | | | .0977 |
| | 46-F3-4P | | | | .0900 |
| | 46-F3-9P | | | | .0814 |

Table C-6--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | 46-F1-3P | | | | .5178R<br>.3509R |
| | 46-F1-9P | | | | .4674L<br>.3478R |
| | 46-F1-14P | | | | .4193L<br>.3631R |
| | 46-F2-1P | | | | .1055L<br>.2970R |
| | 46-F2-6P | | | | .3660R |
| | 46-F2-11P | | | | .3582R |
| | 46-F2-16P | | | | .3331R |
| -- Area of Vibratory Mass | 46-F1-3P | .1409R | 1.6238R | .3616R | .3195R |
| | 46-F1-9P | .1868R | 1.6161R | .4423R | .3801R |
| | 46-F1-14P | .1337R | 1.4625R | .3399R | .3958R |
| | 46-F2-1P | .1728R | 1.6224R | .4211R | .3592R |
| | 46-F2-6P | .2076R | 1.9591R | .4165R | .4196R |
| | 46-F2-11P | .1850R | 1.8736R | .3316R | .3887R |
| | 46-F2-16P | .1292R | 1.7040R | .3720R | .3411R |

* L = left, R = right; no letter = neither L nor R is indicated.

Table C-7. Apparent Size of Structures/Specimen 4/Sagittal Plane/Left Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 68-F5-1L | .0690 | 1.3063 | .3597 | .0953 |
| | 68-F5-2L | .0870 | 1.5676 | .6593 | .1272 |
| | 68-F5-5L | .1881 | 1.6636 | .4965 | .5172 |
| | 68-F5-7L | .1656 | 1.5977 | .3919 | .3931 |
| | 68-F5-9L | .1779 | 1.7146 | .3168 | .5183 |
| Interarytenoideus Muscle | 68-F1-7L | .0495 | .8900 | .2848 | .1033 |
| | 68-F2-1L | .0428 | .8404 | .2947 | .8329 |
| | 68-F2-3L | .0459 | .9125 | .3169 | .1038 |
| | 68-F2-6L | .0581 | .9788 | .2992 | .1193 |
| | 68-F2-7L | .1773 | 1.7639 | .5951 | .2457 |
| | 68-F3-2L | .1630 | 1.7196 | .6144 | .2793 |
| | 68-F3-4L | .1793 | 1.9606 | .5772 | .2059 |
| | 68-F3-7L | .0517 | 1.0700 | .3136 | .1055 |
| | 68-F3-9L | .0610 | 1.2134 | .4784 | .1085 |
| | 63-F4-3L | .0166 | .7302 | .3086 | .0420 |
| | 68-F4-5L | .0221 | .7896 | .3417 | .0462 |
| | 68-F4-8L | .0102 | .6754 | .0152 | .2687 |
| Lateral Cricoarytenoid Muscle | 68-F5-1L | .0123 | .5366 | .0906 | .1869 |
| | 68-F5-2L | .0087 | .4292 | .0394 | .1271 |

Table C-7--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Posterior Cricoarytenoid Muscle | 68-F3-2L | .4321 | 4.353 | 1.9810 | .2372 |
| | 68-F3-4L | .1318 | 2.9374 | 1.4187 | .0866 |
| | 68-F3-7L | .0578 | 1.7806 | .7988 | .0780 |
| | 68-F3-9L | .0657 | 1.7648 | .8414 | .0916 |
| | 63-F4-3L | .0932 | 1.6160 | .6677 | .1424 |
| | 68-F4-5L | .0959 | 1.6117 | .7362 | .1255 |
| | 68-F4-8L | .0880 | 1.8637 | .7293 | .1305 |
| | 68-F5-1L | .0468 | 1.0279 | .4040 | .1050 |
| | 68-F5-2L | .0212 | .6847 | .2662 | .0521 |
| Thyroarytenoid Muscle | 68-F3-2L | .2357 | 2.0103 | .2410 | .7152 |
| | 68-F3-4L | .6754 | 4.5848 | .3556 | 1.3031 |
| | 68-F3-7L | .1712 | 2.4115 | .1829 | .6706 |
| | 68-F3-9L | .1721 | 2.0446 | .6399 | .2792 |
| | 63-F4-3L | .0359 | .9992 | .0810 | .4415 |
| | 68-F4-5L | .0558 | 1.4561 | .6860 | .0907 |
| | 68-F4-8L | .0514 | 1.1416 | .1184 | .4433 |
| | 68-F5-1L | .0846 | 1.3717 | .1658 | .4468 |
| | 68-F5-2L | .0436 | .8598 | .1377 | .3597 |

Table C-7--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Anterior Cricothyroid Ligament | 68-F2-7L | | | .7165 | |
| Posterior Cricoarytenoid Ligament | 68-F3-4L | | | .4594 | |
| | 68-F3-7L | | | .3945 | |
| | 68-F3-9L | | | .3785 | |
| Thyroid Cartilage | 68-F3-2L | | | 1.8108 | |
| | 68-F3-4L | | | 2.3446 | |
| | 68-F3-7L | | | 1.0239 | |
| | 68-F3-9L | | | 1.2068 | |
| | 63-F4-3L | | | .9510 | |
| | 68-F4-5L | | | .9909 | |
| | 68-F4-8L | | | .9218 | |
| | 68-F5-1L | | | .8860 | |
| | 68-F5-2L | | | .9072 | |
| | 68-F5-5L | | | .7418 | |
| | 68-F5-7L | | | 1.1713 | |
| | 68-F5-9L | | | 1.1249 | |

Table C-8. Apparent Size of Structures/Specimen 4/Sagittal Plane/Right Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 68-F7-4R | .0289 | .8556 | .3545 | .0675 |
| | 68-F7-7R | .0698 | 1.6629 | .8011 | .1493 |
| | 68-F8-1R | .0779 | 1.5064 | .6775 | .3314 |
| | 68-F8-4R | .1831 | 1.8536 | .3061 | .5543 |
| | 68-F8-7R | .1221 | 1.3845 | .4053 | .2317 |
| | 68-F8-10R | .1241 | 1.3515 | .4710 | .2860 |
| | 68-F8-13R | .1901 | 1.8359 | .5042 | .4823 |
| Interarytenoideus Muscle | 68-F8-1R | .0426 | 1.1795 | .5188 | .0984 |
| | 68-F8-4R | .0624 | 1.4129 | .7587 | .0870 |
| Lateral Cricoarytenoid Muscle | 68-F8-1R | .0940 | 1.1921 | .3628 | .2443 |
| | 68-F8-4R | .0295 | .8147 | .1923 | .1437 |
| Posterior Cricoarytenoid Muscle | 68-F6-1R | .0285 | .7277 | .2650 | .0831 |
| | 68-F7-7R | .0277 | .6718 | .2507 | .0696 |
| | 68-F8-1R | .0642 | 1.2864 | .4503 | .0932 |
| | 68-F8-4R | .0717 | 1.2321 | .4847 | .1335 |
| Thyroarytenoid Muscle | 68-F6-1R | .1149 | 1.4336 | .1771 | .5012 |
| | 68-F6-3R | .1291 | 1.6192 | .2558 | .6081 |
| | 68-F7-1R | .0942 | 1.4417 | .1571 | .5287 |
| | 68-F7-4R | .0874 | 1.5047 | .2434 | .4779 |

Table C-8--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Anterior-Posterior (Inch) |
|---|---|---|---|---|---|
| Thyroarytenoid Muscle (cont.) | 68-F7-7R | .0487 | .8649 | .2137 | .2536 |
| | 68-F8-1R | .0460 | .8098 | .1858 | .1665 |
| Height of TVF | 68-F6-1R | | | .4631 | |
| | 68-F6-3R | | | .3803 | |
| | 68-F7-1R | | | .5032 | |
| | 68-F7-4R | | | .4478 | |
| Thyroid Cartilage | 68-F6-1R | | | .8610 | |
| | 68-F6-3R | | | .9480 | |
| | 68-F7-1R | | | 1.0284 | |
| | 68-F7-4R | | | .8895 | |
| | 68-F7-7R | | | .9436 | |
| | 68-F8-1R | | | .9631 | |
| | 68-F8-4R | | | .9244 | |
| | 68-F8-7R | | | .9961 | |

Table C-9. Apparent Size of Structures/Specimen 5/Transverse Plane/Left Medial Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 62-F3-8M | .0760 | 1.2209 | .2076 | .5351 |
| | 62-F3-11M | .0361 | 1.1687 | .4584 | .0980 |
| | 62-F3-15M | .0308 | 1.0243 | .3922 | .0287 |
| | 62-F3-18M | .0110 | .7686 | .3361 | .0233 |
| Interarytenoideus Muscle | 62-F3-2M | .0932 | 1.2657 | .2003 | .4230 |
| | 62-F3-5M | .0607 | 1.1562 | .0820 | .4177 |
| | 62-F3-8M | .0305 | .8941 | .0605 | .3622 |
| Lateral Cricoarytenoid Muscle | 62-F2-5M | .0143 | .6651 | .1827 | .0320 |
| | 62-F2-7M | .0084 | .5535 | .1622 | .0226 |
| | 62-F2-9M | .0062 | .4439 | .1112 | .0155 |
| | 62-F2-11M | .0136 | .6975 | .1886 | .0133 |
| | 62-F2-13M | .0144 | 1.1044 | .4619 | .0290 |
| | 62-F2-15M | .0150 | .9551 | .3989 | .0137 |
| | 62-F2-17M | .0244 | .8588 | .3100 | .0411 |
| | 62-F3-2M | .0150 | .8103 | .3901 | .0380 |
| | 62-F3-5M | .0163 | .8377 | .2537 | .0269 |
| Posterior Cricoarytenoid Muscle | 62-F2-1M | .0058 | .4541 | .0141 | .1405 |
| | 62-F2-3M | .0096 | .5274 | .0276 | .2162 |
| | 62-F2-5M | .0160 | .6688 | .0451 | .2666 |

Table C-9--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Posterior Cricoarytenoid Muscle (cont.) | 62-F2-7M | .0225 | .7393 | .0493 | .2608 |
| | 62-F2-9M | .0227 | .7190 | .0748 | .2652 |
| | 62-F2-11M | .0397 | .9585 | .0956 | .3781 |
| | 62-F2-13M | .0420 | .9842 | .0686 | .3893 |
| | 62-F2-15M | .0341 | .8048 | .0717 | .2475 |
| | 62-F2-17M | .0433 | .9551 | .0745 | .3749 |
| | 62-F3-2M | .0446 | 1.0855 | .0854 | .3811 |
| | 62-F3-8M | .0760 | 1.2209 | .2011 | .3641 |
| | 62-F3-11M | .1009 | 1.2970 | .2449 | .4290 |
| | 62-F3-15M | .0894 | 1.2260 | .1889 | .4069 |
| Thyroarytenoid Muscle | 62-F3-2M | .0157 | .5862 | .0790 | .1386 |
| | 62-F3-5M | .0160 | .5640 | .1166 | .1348 |
| | 62-F3-8M | .0478 | .8976 | .2535 | .2468 |
| | 62-F3-11M | .0489 | .8583 | .2020 | .2186 |
| | 62-F3-15M | .0557 | 1.0647 | .2301 | .1138 |
| | 62-F3-18M | .0922 | 1.7482 | .6422 | .2916 |
| | 62-F4-3M | .0827 | 1.4783 | .6461 | .2065 |

Table C-10. Apparent Size of Structures/Specimen 5/Transverse Plane/Right Medial Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Interarytenoideus Muscle | 62-F2-10M | .0585 | 1.0400 | .2115 | .3359 |
| | 62-F2-14M | .0827 | 1.2952 | .1416 | .4848 |
| | 62-F2-18M | .0816 | 1.3716 | .5896 | .2332 |
| | 62-F3-4M | .0854 | 1.3716 | .2248 | .5448 |
| | 62-F3-8M | .0952 | 1.3919 | .2488 | .5082 |
| | 62-F3-12M | .0900 | 1.2977 | .1981 | .5041 |
| | 62-F3-16M | .0943 | 1.3961 | .2515 | .5366 |
| Lateral Cricoarytenoid Muscle | 62-F2-18M | .0246 | .7528 | .3042 | .0648 |
| | 62-F3-4M | .0321 | 1.0137 | .4225 | .0598 |
| | 62-F3-8M | .0316 | 1.0164 | .4298 | .0643 |
| | 62-F3-12M | .0092 | .5452 | .2434 | .0348 |
| Posterior Cricoarytenoid Muscle | 62-F2-10M | .0145 | .7847 | .0591 | .3591 |
| | 62-F2-14M | .0397 | 1.2562 | .0749 | .5051 |
| | 62-F2-18M | .0399 | 1.1909 | .0813 | .5852 |
| | 62-F3-4M | .0537 | 1.2480 | .0673 | .5628 |
| | 62-F3-8M | .0512 | 1.2649 | .0724 | .6040 |
| | 62-F3-12M | .0519 | 1.2667 | .0540 | .6394 |
| | 62-F3-16M | .0512 | 1.1885 | .0960 | .5795 |
| | 62-F4-2M | .0458 | 1.1529 | .0688 | .4735 |
| | 62-F4-6M | .0480 | 1.5524 | .7461 | .0453 |

Table C-10--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Anterior-Posterior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Posterior Cricoarytenoid Muscle (cont.) | 62-F4-10M | .0279 | 1.0450 | .0308 | .4792 |
| Thyroarytenoid Muscle | 62-F3-4M | .0618 | 1.0381 | .4014 | .1302 |
| | 62-F3-8M | .0904 | 1.2385 | .3856 | .2549 |
| | 62-F3-12M | .0666 | 1.0906 | .3607 | .1465 |
| | 62-F3-16M | .1198 | 1.7964 | .6236 | .2418 |
| | 62-F4-2M | .0557 | 1.1424 | .3796 | .1388 |
| | 62-F4-6M | .1440 | 1.8049 | .7477 | .1486 |
| | 62-F4-10M | .1483 | 1.9740 | .8886 | .1927 |

Table C-11. Apparent Size of Structures/Specimen 6/Coronal Plane/Anterior Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 69-F1-3A | .0423L<br>.0257R | 1.0559L<br>.7850R | .4241L<br>.2821R | .1644L<br>.1788R |
| | 69-F1-6A | .0361L<br>.0375R | .8898L<br>.8846R | .3675L<br>.3619R | .1618L<br>.1773R |
| | 69-F1-9A | .0407L<br>.0188R | .9085L<br>.5578R | .3779L<br>.2314R | .1390L<br>.1046R |
| | 69-F1-11A | .0413L<br>.0386R | .8629L<br>.9445R | .2779L<br>.3653R | .1984L<br>.0920R |
| Thyroarytenoid Muscle | 69-F1-6A | .0970L<br>.0616R | 1.4748L<br>1.2871R | .6581L<br>.5517R | .2606L<br>.2035R |
| | 69-F1-9A | .0884L<br>.0578R | 1.3891L<br>1.0025R | .6411L<br>.3595R | .2156L<br>.1749R |
| | 69-F1-11A | .0529L<br>.0567R | 1.2082L<br>1.1407R | .4700L<br>.4605R | .1618L<br>.1532R |
| | 69-F1-14A | .0581L<br>.0422R | 1.2176L<br>1.1760R | .5511L<br>.5375R | .1658L<br>.1134R |
| | 69-F1-18A | .0248L<br>.0262R | .7825L<br>.8543R | .3381L<br>.3210R | .1272L<br>.0722R |
| | 69-F2-3A | .0117L<br>.0071R | .4923L<br>.4632R | .2081L<br>.1566R | .0608L<br>.0402R |
| | 69-F2-7A | .0091L<br>.0063R | .6005L<br>.4941R | .2796L<br>.1882R | .0443L<br>.0847R |
| Conus Elasticus | 69-F1-3A | | | .4850L<br>.4950R | |
| | 69-F1-6A | | | .4298L<br>.4656R | |
| | 69-F1-9A | | | .5050R | |

Table C-11--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Surface Width of TVF | 69-F1-3A | | | | .0886L<br>.1360R |
| | 69-F1-6A | | | | .0856L<br>.1089R |
| | 69-F1-9A | | | | .1027L<br>.1045R |
| | 69-F1-11A | | | | .1224L<br>.1294R |
| | 69-F1-14A | | | | .1248L |
| | 69-F1-18A | | | | .1143L<br>.1203R |
| | 69-F2-3A | | | | .0791L<br>.0454R |
| | 69-F2-7A | | | | .1312L<br>.0771R |
| Thyroid Cartilage<br>-- Distance between<br>Superior Apexes | 69-F1-3A | | | | .8727 |
| | 69-F1-6A | | | | .9350 |
| | 69-F1-9A | | | | .8642 |
| | 69-F1-11A | | | | .7961 |
| | 69-F1-14A | | | | .8022 |
| | 69-F1-18A | | | | .6770 |
| | 69-F2-3A | | | | .5754 |
| | 69-F2-7A | | | | .6030 |

Table C-11--continued.

| Structure | Slide # | Area (Sq.Inch) | Perimeter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage | | | | | |
| -- Distance between Inferior Prominences (cont.) | 69-F1-3A | | | | .9503 |
| | 69-F1-6A | | | | .7585 |
| | 69-F1-9A | | | | .6616 |
| | 69-F1-11A | | | | .4373 |
| | 69-F1-14A | | | | .2930 |
| -- Height | 69-F1-3A | | | 1.0979L<br>1.0200R | |
| | 69-F1-6A | | | .9975L<br>1.0020R | |
| | 69-F1-9A | | | .9866L<br>1.0183R | |
| | 69-F1-11A | | | 1.0981L<br>1.0571R | |
| | 69-F1-14A | | | 1.1902L<br>1.1634R | |
| | 69-F1-18A | | | 1.1302L<br>1.1622R | |
| | 69-F2-3A | | | 1.0327L<br>.9248R | |
| | 69-F2-3A | | | .1013L<br>.0703R | |
| | 69-F2-7A | | | 1.0652L<br>1.1009R | |

Table C-11--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage -- Height (cont.) | 69-F2-10A | | | .9674L<br>1.0363R | |
| Vibratory Mass Measures -- Height from Cricoid to TVF | 69-F1-3A | | | .4531L<br>.3224R | |
| | 69-F1-6A | | | .4000L<br>.3210R | |
| | 69-F1-9A | | | .5661L<br>.4996R | |
| | 69-F1-11A | | | .6472L<br>.6599R | |
| | 69-F1-14A | | | .4968L<br>.5458R | |
| -- Phonatory Position (glottal width/2) | 69-F1-3A | | | | .0491 |
| | 69-F1-6A | | | | .0435 |
| | 69-F1-9A | | | | .0496 |
| | 69-F1-11A | | | | .0422 |
| -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | 69-F1-3A | | | | .2636L<br>.2722R |
| | 69-F1-6A | | | | .2405L<br>.2411R |
| | 69-F1-9A | | | | .1752L<br>.1858R |

Table C-11--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage (cont.) | 69-F1-11A | | | | .1699L<br>.1313R |
| | 69-F1-14A | | | | .1518L<br>.1030R |
| | 69-F1-18A | | | | .1323L<br>.1322R |
| | 69-F2-3A | | | | .1013L<br>.0703R |
| | 69-F2-7A | | | | .1513L<br>.1465R |
| -- Area of Vibratory Mass | 69-F1-3A | .1505L<br>.1349R | 1.6719L<br>1.7276R | .5861L<br>.5781R | .2778L<br>.2757R |
| | 69-F1-6A | .1467L<br>.1280R | 1.7024L<br>1.6996R | .7069L<br>.6406R | .2443L<br>.2622R |
| | 69-F1-9A | .1068L<br>.1304R | 1.4632L<br>1.5296R | .5427L<br>.5089R | .2247L<br>.2268R |
| | 69-F1-11A | .1340L<br>.1649R | 2.0242L<br>2.1098R | .7109L<br>.8595R | .2117L<br>.1547R |
| | 69-F1-14A | .0860L<br>.1257R | 1.7673L<br>1.9662R | .6670L<br>.7596R | .1542L<br>.1804R |
| | 69-F1-18A | .0481L<br>.0444R | .9124L<br>.8727R | .3049L<br>.3020R | .1341L<br>.1371R |
| | 69-F2-3A | .0377L<br>.0438R | .9847L<br>1.0827R | .4050L<br>.3659R | .1498L<br>.1623R |

Table C-11--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral (Inch) |
|---|---|---|---|---|---|
| Vibratory Mass Measures -- Area of Vibratory Mass (cont.) | 69-F2-7A | .0218L<br>.0168R | .6277L<br>.5663R | .1611L<br>.1620R | .1621L<br>.1489R |

* L = left, R = right; no letter = neither L nor R is indicated.

Table C-12. Apparent Size of Structures/Specimen 6/Coronal Plane/Posterior Block

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Cricothyroid Muscle | 69-F1-2P | .0472R | 1.0663R | .4063R | .1974R |
| | 69-F1-4P | .0428R | .9725R | .3665R | .1464R |
| | 69-F1-7P | .0546L<br>.0717R | 1.7088L<br>1.4901R | .7649L<br>.7311R | .1398L<br>.1264R |
| | 69-F1-9P | .0544L<br>.0407R | 1.4229L<br>1.1372R | .6149L<br>.5073R | .1108L<br>.0981R |
| | 69-F1-13P | .0493L<br>.0697R | 1.3687L<br>1.4686R | .6040L<br>.6230R | .0844L<br>.1000R |
| | 69-F1-18P | .0385L<br>.0194R | 1.1740L<br>.6718R | .5107L<br>.1797R | .0829L<br>.0704R |
| | 69-F2-3P | .0395L<br>.0368R | 1.2494L<br>1.2353R | .5163L<br>.4214R | .1039L<br>.0647R |
| | 69-F2-6P | .0226L<br>.0320R | .9795L<br>.9225R | .4768L<br>.3552R | .1005L<br>.0933R |
| | 69-F2-10P | .0253L<br>.0949R | .9155L<br>2.0353R | .3621L<br>.6819R | .0865L<br>.1945R |
| | 69-F2-15P | .0371L | 1.0632L | .3877L | .0754L |
| | 69-F2-18P | .0266L | .8715L | .2922L | .0657L |
| Interarytenoideus Muscle | 69-F1-18P | .0824 | 1.5325 | .6664 | .1463 |
| | 69-F2-3P | .0812 | 1.4533 | .1294 | .5563 |
| | 69-F2-6P | .0665 | 1.4223 | .1470 | .6689 |
| | 69-F2-15P | .0117 | 1.3473 | .0565 | .5235 |
| Lateral Cricoarytenoid Muscle | 69-F1-2P | .0185R | .6965R | .1577R | .2276R |

Table C-12--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Lateral Cricoarytenoid Muscle (cont.) | 69-F1-4P | .0124R | .5409R | .0883R | .1424R |
| | 69-F1-7P | .0265R | .6778R | .1593R | .1709R |
| | 69-F1-9P | .0184L<br>.0250R | .5942L<br>.5981R | .1774L<br>.1783R | .1243L<br>.1297R |
| Posterior Cricoarytenoid Muscle | 69-F1-9P | .0127R | .5271R | .1523R | .1274R |
| | 69-F1-13P | .0085R | .4965R | .2889R | .0374R |
| | 69-F1-18P | .0019R | .1735R | .0632R | .0361R |
| | 69-F2-3P | .0116R | .6776R | .2680R | .0492R |
| | 69-F2-6P | .0103L<br>.0154R | .4830L<br>.5618R | .1873L<br>.2439R | .0721L<br>.0813R |
| | 69-F2-10P | .0182L<br>.0453R | .5877L<br>1.2600R | .1988L<br>.5153R | .0847L<br>.1030R |
| | 69-F2-15P | .0207L<br>.0343R | .6591L<br>1.1502R | .2227L<br>.4287R | .0828L<br>.0591R |
| | 69-F2-18P | .0169L<br>.0507R | .5623L<br>1.3550R | .1866L<br>.5274R | .0788L<br>.0707R |
| | 69-F3-3P | .0431R | 1.3322R | .7255R | .0525R |
| Thyroarytenoid Muscle | 69-F1-2P | .1022R | 1.5688R | .5638R | .3766R |
| | 69-F1-4P | .0626L<br>.0878R | 1.1856L<br>1.3114R | .3766L<br>.4027R | .2166L<br>.2693R |
| | 69-F1-7P | .0943L<br>.0776R | 1.2069L<br>1.0273R | .3271L<br>.2211R | .3216L<br>.2745R |
| | 69-F1-9P | .0855L<br>.0430R | 1.1624L<br>.9750R | .2908L<br>.2072R | .3078L<br>.3886R |

Table C-12--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroarytenoid Muscle (cont.) | 69-F1-13P | .1440L<br>.0911R | 1.6525L<br>1.3250R | .4368L<br>.2666R | .3540L<br>.2842R |
| | 69-F1-18P | .0440L | .9372L | .2278L | .2197L |
| | 69-F2-3P | .0340L<br>.0257R | .8465L<br>.7607R | .2457L<br>.1025R | .2336L<br>.2301R |
| | 69-F2-6P | .0267R | .7566R | .2215R | .2202R |
| Conus Elasticus | 69-F1-2P | | | .5098R | |
| | 69-F1-4P | | | .4962L<br>.4057R | |
| | 69-F1-7P | | | .5012L<br>.3709R | |
| | 69-F1-9P | | | .3667L<br>.2841R | |
| | 69-F1-13P | | | .3120L<br>.1821R | |
| | 69-F1-18P | | | .3722L<br>.1670R | |
| | 69-F2-3P | | | .2258L<br>.1003R | |
| Thyroid Cartilage -- Distance between Superior Apexes | 69-F1-2P | | | | 1.1672 |
| | 69-F1-4P | | | | 1.0519 |
| | 69-F1-7P | | | | 1.1302 |
| | 69-F1-9P | | | | .9925 |

Table C-12--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage -- Distance between Superior Apexes (cont.) | 69-F1-13P | | | | .9274 |
| | 69-F1-18P | | | | 1.1156 |
| | 69-F2-3P | | | | 1.0556 |
| | 69-F2-6P | | | | 1.1492 |
| -- Distance between Inferior Prominences | 69-F1-2P | | | | 1.0454 |
| | 69-F1-4P | | | | .9038 |
| | 69-F1-7P | | | | .9197 |
| | 69-F1-9P | | | | .8742 |
| | 69-F1-13P | | | | .8687 |
| | 69-F1-18P | | | | .9310 |
| | 69-F2-3P | | | | 1.0116 |
| | 69-F2-6P | | | | 1.0263 |
| | 69-F2-10P | | | | 1.0663 |
| -- Height | 69-F1-2P | | | 1.1427L<br>.9682R | |
| | 69-F1-4P | | | .9076L<br>.8477R | |
| | 69-F1-7P | | | .9845L<br>.7946R | |
| | 69-F1-9P | | | .8591L<br>.7325R | |

Table C-12--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral-(Inch) |
|---|---|---|---|---|---|
| Thyroid Cartilage -- Height (cont.) | 69-F1-13P | | | .8551L<br>.7860R | |
| | 69-F1-18P | | | .8246L<br>1.0152R | |
| | 69-F2-3P | | | .7179L<br>1.0053R | |
| | 69-F2-6P | | | 1.2155R | |
| | 69-F2-10P | | | .3500R | |
| Vibratory Mass Measures -- Medial Aspect of Thyroarytenoid to Thyroid Cartilage | 69-F1-2P | | | | .3766R |
| | 69-F1-4P | | | | .3246L<br>.3558R |
| | 69-F1-7P | | | | .3545L<br>.3877R |
| | 69-F1-9P | | | | .2654L<br>.2974R |
| | 69-F1-13P | | | | .3703L<br>.3425R |
| | 69-F1-18P | | | | .2259L |
| | 69-F2-3P | | | | .2497L<br>.1874R |
| -- Area of Vibratory Mass | 69-F1-2P | .1725R | 2.0100R | .5812R | .4071R |
| | 69-F1-4P | .1393L<br>.1650R | 1.7387L<br>1.7960R | .5517L<br>.4415R | .3498L<br>.3558R |

Table C-12--continued.

| Structure | Slide # | Area (Sq.Inch) | Peri-meter (Inch) | Inferior-Superior (Inch) | Medial-Lateral- (Inch) |
|---|---|---|---|---|---|
| Vibratory Mass Measures -- Area of Vibratory Mass (cont.) | 69-F1-7P | .1630L<br>.1287R | 1.8518L<br>1.4590R | .5286L<br>.3384R | .5006L<br>.3960R |
| | 69-F1-9P | .1527L<br>.1989R | 1.7791L<br>2.0116R | .5105L<br>.4738R | .3318L<br>.3112R |
| | 69-F1-13P | .1847L<br>.1865R | 2.2236L<br>2.0105R | .4752L<br>.4171R | .4684L<br>.3842R |
| | 69-F1-18P | .0769L | 1.3278L | .2761L | .2284L |
| | 69-F2-3P | .0768L | 1.2560L | .2480L | .3079L |

* L = left, R = right; no letter = neither L nor R is indicated.

# APPENDIX D
# SUMMATION: THE MISSING DIMENSION DUE TO DISSECTION PLANE

Table D-1. Apparent Size of Structure/Specimen 1/Sagittal Plane/Left Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Medial to Lateral Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 75-F2-14L to 75-F3-1L | 5 | 35 microns | 1050 microns or 1.05 mm |
| Interarytenoideus Muscle | 75-F1-5L to 75-F2-5L | 5 | 35 microns | 3325 microns or 3.325 mm |
| Lateral Cricoarytenoid Muscle | 75-F2-14L (only in 1 slide) | 5 | 35 microns | 175 microns or .175 mm |
| Posterior Cricoarytenoid Muscle | 75-F1-9L to 75-F3-1L | 5 | 35 microns | 1925 microns or 1.925 mm |
| Thyroarytenoid Muscle | 75-F1-13L to 75-F3-14L | 5 | 35 microns | 6650 microns or 6.65 mm |
| Conus Elasticus | 75-F2-14L | 5 | 35 microns | 175 microns or .175 mm |
| Posterior Cricoarytenoid Ligament | 75-F1-13L to 75-F2-9L | 5 | 35 microns | 2625 microns or 2.625 mm |

NOTE: Sagittal Plane: The missing dimension dictated by this plane is the medial-lateral distance. This table is a summation of that distance.

Table D-2. Apparent Size of Structure/Specimen 1/Sagittal Plane/Right Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Medial to Lateral Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 75-F2-9R to 75-F3-17R | 5 | 35 microns | 4725 microns or 4.725 mm |
| Interarytenoideus Muscle | 75-F2-18R to 75-F3-17R | 5 | 35 microns | 3150 microns or 3.15 mm |
| Lateral Cricoarytenoid Muscle | 75-F1-14R to 75-F2-3R | 5 | 35 microns | 1400 microns or 1.4 mm |
| Posterior Cricoarytenoid Muscle | 75-F1-10R to 75-F3-17R | 5 | 35 microns | 7700 microns or 7.7 mm |
| Thyroarytenoid Muscle | 75-F1-7R to 75-F3-17R | 5 | 35 microns | 8225 microns or 8.225 mm |
| Anterior Cricoarytenoid Ligament | 75-F1-18R to 75-F3-13R | 5 | 35 microns | 5600 microns or 5.6 mm |
| Posterior Cricoarytenoid Ligament | 75-F3-13R | 5 | 35 microns | 175 microns or .175 mm |
| Thyroid Cartilage | 75-F1-10R to 75-F4-6R | 5 | 35 microns | 8925 microns or 8.925 mm |

NOTE: Sagittal Plane: The missing dimension dictated by this plane is the medial-lateral distance. This table is a summation of that distance.

Table D-3. Apparent Size of Structure/Specimen 2/Transverse Plane/Superior Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Inferior to Superior Distance |
|---|---|---|---|---|
| Interarytenoideus Muscle | 48-F1-1S to 48-F2-5S | 10 | 35 microns | 8050 microns or 8.05 mm |
| Lateral Cricoarytenoid Muscle | 48-F1-1S to 48-F1-7S | 10 | 35 microns | 2450 microns or 2.45 mm |
| Posterior Cricoarytenoid Muscle | 48-F1-1S to 48-F1-9S | 10 | 35 microns | 3150 microns or 3.15 mm |
| Thyroarytenoid Muscle | 48-F1-3S to 48-F2-11S | 10 | 35 microns | 9450 microns or 9.45 mm |
| Posterior Cricoarytenoid Ligament | 48-F1-11S | 10 | 35 microns | 350 microns or .35 mm |

NOTE: Transverse Plane: The missing dimension dictated by this plane is the inferior-superior distance. This table is a summation of that distance.

Table D-4. Apparent Size of Structure/Specimen 2/Transverse Plane/Medial Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Inferior to Superior Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 48-F1-4M to 48-F2-4M | 10 | 35 microns | 6650 microns or 6.65 mm |
| Lateral Cricoarytenoid Muscle | 48-F1-2M to 48-F2-4M | 10 | 35 microns | 7350 microns or 7.35 mm |
| Posterior Cricoarytenoid | 48-F1-2M to 48-F2-4M | 10 | 35 microns | 7350 microns or 7.35 mm |
| Thyroarytenoid Muscle | 48-F1-2M | 10 | 35 microns | 350 microns or .35 mm |

NOTE: Transverse Plane: The missing dimension dictated by this plane is the inferior-superior distance. This table is a summation of that distance.

Table D-5. Apparent Size of Structure/Specimen 3/Coronal Plane/Anterior Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 46-F1-4A to 46-F3-9A | 5 | 35 microns | 7350 microns or 7.35 mm |
| Lateral Cricoarytenoid Muscle | 46-F2-1A to 46-F2-13A | 5 | 35 microns | 2275 microns or 2.275 mm |
| Thyroarytenoid Muscle | 46-F1-4A to 46-F3-9A | 5 | 35 microns | 7350 microns or 7.35 mm |
| Thyromuscularis Bundle of Thyroarytenoid | 46-F3-5A | 5 | 35 microns | 175 microns or .175 mm |
| Thyrovocalis Bundle of Thyroarytenoid | 46-F3-5A | 5 | 35 microns | 175 microns or .175 mm |
| Conus Elasticus | 46-F1-4A to 46-F2-18A | 5 | 35 microns | 5775 microns or 5.775 mm |
| Surface of TVF | 46-F1-4A to 46-F3-9A | 5 | 35 microns | 7350 mcirons or 7.35 mm |
| Thyroid Cartilage-- Superior Apexes Present | 46-F1-4A to 46-F4-12A | 5 | 35 microns | 11025 microns or 11.025 mm |
| Thyroid Cartilage-- Inferior Prominences Present | 46-F1-4A to 46-F4-12A | 5 | 35 microns | 11025 microns or 11.025 mm |
| Body of Thyroid Cartilage | 46-F1-4A to 45-F4-12A | 5 | 35 microns | 11025 microns or 11.025 mm |

Table D-5--continued.

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Vibratory Mass--<br>Cricoid to TVF | 46-F1-4A<br>to<br>46-F3-14A | 5 | 35<br>microns | 8225 microns<br>or<br>8.225 mm |
| Phonatory Position--<br>Presence of Glottal<br>Aperture | 46-F1-4A<br>to<br>46-F3-14A | 5 | 35<br>microns | 8225 microns<br>or<br>8.225 mm |
| Vibratory Mass--<br>Thyroarytenoid to<br>Thyroid Cartilage | 46-F1-4A<br>to<br>46-F3-9A | 5 | 35<br>microns | 7350 microns<br>or<br>7.35 mm |
| Area of Vibratory Mass | 46-F1-4A<br>to<br>46-F3-9A | 5 | 35<br>microns | 7350 microns<br>or<br>7.35 mm |

NOTE: Coronal Plane: The missing dimension dictated by this plane is the anterior-posterior distance. This table is a summation of that distance.

Table D-6. Apparent Size of Structure/Specimen 3/Coronal Plane/Posterior Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 46-F1-3P to 46-F3-14P | 5 | 35 microns | 8400 microns or 8.4 mm |
| Interarytenoideus Muscle | 46-F2-16P to 46-F4-6P | 5 | 35 microns | 4725 microns or 4.725 mm |
| Lateral Cricoarytenoid Muscle | 46-F1-14P to 46-F2-16P | 5 | 35 microns | 3675 microns or 3.675 mm |
| Posterior Cricoarytenoid Muscle | 46-F1-14P to 46-F4-6P | 5 | 35 microns | 8225 microns or 8.225 mm |
| Thyroarytenoid Muscle | 46-F1-3P to 46-F2-16P | 5 | 35 microns | 5600 microns or 5.6 mm |
| Conus Elasticus | 46-F1-3P to 46-F2-11P | 5 | 35 microns | 4725 microns or 4.725 mm |
| Surface TVF | 46-F1-3P | 5 | 35 microns | 175 microns or .175 mm |
| Thyroid Cartilage-- Superior Apexes Present | 46-F1-3P to 46-F3-14P | 5 | 35 microns | 8400 microns or 8.4 mm |
| Thyroid Cartilage-- Inferior Prominences Present | 46-F1-3P to 46-F3-9P | 5 | 35 microns | 7525 microns or 7.525 mm |
| Body of Thyroid Cartilage | 46-F1-3P to 46-F4-11P | 5 | 35 microns | 11025 microns or 11.025 mm |
| Vibratory Mass-- Cricoid to TVF | 46-F1-3P to 46-F1-9P | 5 | 35 microns | 350 microns or .35 mm |

Table D-6--continued.

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Phonatory Position--Presence of Glottal Aperture | 46-F1-3P to 46-F3-9P | 5 | 35 microns | 7525 microns or 7.525 mm |
| Vibratory Mass--Thyroarytenoid to Thyroid Cartilage | 46-F1-3P to 46-F2-16P | 5 | 35 microns | 5600 microns or 5.6 mm |
| Area of Vibratory Mass | 46-F1-3P to 46-F2-16P | 5 | 35 microns | 5600 microns or 5.6 mm |

NOTE: Coronal Plane: The missing dimension dictated by this plane is the anterior-posterior distance. This table is a summation of that distance.

Table D-7. Apparent Size of Structure/Specimen 4/Sagittal Plane/Left Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Medial to Lateral Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 68-F5-1L to 68-F5-9L | 10 | 35 microns | 31500 microns or 31.5 mm |
| Interarytenoideus Muscle | 68-F1-7L to 68-F4-8L | 10 | 35 microns | 19600 microns or 19.6 mm |
| Lateral Cricoarytenoid Muscle | 68-F5-1L to 68-F5-2L | 10 | 35 microns | 700 microns or .7 mm |
| Posterior Cricoarytenoid Muscle | 68-F3-2L to 68-F5-2L | 10 | 35 microns | 12950 microns or 12.95 mm |
| Thyroarytenoid Muscle | 68-F3-2L to 68-F5-2L | 10 | 35 microns | 12950 microns or 12.95 mm |
| Anterior Cricothyroid Ligament | 68-F2-7L | 10 | 35 microns | 350 microns or .35 mm |
| Posterior Cricothyroid Ligament | 68-F3-4L to 68-F3-9L | 10 | 35 microns | 2100 microns or 2.1 mm |
| Thyroid Cartilage | 68-F3-2L to 68-F5-9L | 10 | 35 microns | 15400 microns or 15.4 mm |

NOTE: Sagittal Plane: The missing dimension dictated by this plane is the medial-lateral distance. This table is a summation of that distance.

Table D-8. Apparent Size of Structure/Specimen 4/Sagittal Plane/Right Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Medial to Lateral Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 68-F7-4R to 68-F8-13R | 10 | 35 microns | 9800 microns or 9.8 mm |
| Interarytenoideus Muscle | 68-F8-1R to 68-F8-4R | 10 | 35 microns | 1400 microns or 1.4 mm |
| Lateral Cricoarytenoid Muscle | 68-F8-1R to 68-F8-4R | 10 | 35 microns | 1400 microns or 1.4 mm |
| Posterior Cricoarytenoid Muscle | 68-F6-1R to 68-F8-4R | 10 | 35 microns | 14000 microns or 14 mm |
| Thyroarytenoid Muscle | 68-F6-1R to 68-F8-1R | 10 | 35 microns | 12950 microns or 12.95 mm |
| Height of TVF | 68-F6-1R to 68-F7-4R | 10 | 35 microns | 7700 microns or 7.7 mm |
| Thyroid Cartilage | 68-F6-1R to 68-F8-7R | 10 | 35 microns | 15050 microns or 15.05 mm |

NOTE: Sagittal Plane: The missing dimension dictated by this plane is the medial-lateral distance. This table is a summation of that distance.

Table D-9. Apparent Size of Structure/Specimen 5/Transverse Plane/Left Medial Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Inferior to Superior Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 62-F3-8M to 62-F3-18M | 5 | 35 microns | 1925 microns or 1.925 mm |
| Interarytenoideus Muscle | 62-F3-2M to 62-F3-8M | 5 | 35 microns | 1225 microns or 1.225 mm |
| Lateral Cricoarytenoid Muscle | 62-F2-5M to 62-F3-5M | 5 | 35 microns | 3325 microns or 3.325 mm |
| Posterior Cricoarytenoid Muscle | 62-F2-1M to 62-F3-15M | 5 | 35 microns | 5775 microns or 5.775 mm |
| Thyroarytenoid Muscle | 62-F3-2M to 62-F4-3M | 5 | 35 microns | 3500 microns or 3.5 mm |

NOTE: Transverse Plane: The missing dimension dictated by this plane is the inferior-superior distance. This table is a summation of that distance.

Table D-10. Apparent Size of Structure/Specimen 5/Transverse Plane/Right Medial Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Inferior to Superior Distance |
|---|---|---|---|---|
| Interarytenoideus Muscle | 62-F2-10M to 62-F3-16M | 5 | 35 microns | 4375 microns or 4.375 mm |
| Lateral Cricoarytenoid Muscle | 62-F2-18M to 62-F3-12M | 5 | 35 microns | 2275 microns or 2.275 mm |
| Posterior Cricoarytenoid Muscle | 62-F2-10M to 62-F4-10M | 5 | 10 microns | 6475 microns or 6.475 mm |
| Thyroarytenoid Muscle | 62-F3-4M to 62-F4-10M | 5 | 35 microns | 4375 microns or 4.375 mm |

NOTE: Transverse Plane: The missing dimension dictated by this plane is the inferior-superior distance. This table is a summation of that distance.

Table D-11. Apparent Size of Structure/Specimen 6/Coronal Plane/Anterior Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 69-F1-3A to 69-F1-11A | 10 | 35 microns | 3150 microns or 3.15 mm |
| Thyroarytenoid Muscle | 69-F1-6A to 69-F2-7A | 10 | 35 microns | 7000 microns or 7.0 mm |
| Conus Elasticus | 69-F1-3A to 69-F1-9A | 10 | 35 microns | 2450 microns or 2.45 mm |
| Surface of TVF | 69-F1-3A to 69-F2-7A | 10 | 35 microns | 8050 microns or 8.05 mm |
| Thyroid Cartilage-- Superior Apexes Present | 69-F1-3A to 69-F2-7A | 10 | 35 microns | 8050 microns or 8.05 mm |
| Thyroid Cartilage-- Inferior Prominences Present | 69-F1-3A to 69-F1-14A | 10 | 35 microns | 4200 microns or 4.2 mm |
| Body of Thyroid Cartilage | 69-F1-3A to 69-F2-10A | 10 | 35 microns | 9100 microns or 9.1 mm |
| Vibratory Mass-- Cricoid to TVF | 69-F1-3A to 69-F1-14A | 10 | 35 microns | 4200 microns or 4.2 mm |
| Phonatory Position-- Presence of Glottal Aperture | 69-F1-3A to 69-F1-11A | 10 | 35 microns | 3150 microns or 3.15 mm |
| Vibratory Mass-- Thyroarytenoid to Thyroid Cartilage | 69-F1-3A to 69-F2-7A | 10 | 35 microns | 8050 microns or 8.05 mm |

Table D-11--continued.

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Area of Vibratory Mass | 69-F1-3A to 69-F2-7A | 10 | 35 microns | 8050 microns or 8.05 mm |

NOTE: Coronal Plane: The missing dimension dictated by this plane is the anterior-posterior distance. This table is a summation of that distance.

Table D-12. Apparent Size of Structure/Specimen 6/Coronal Plane/Posterior Block

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Cricothyroid Muscle | 69-F1-2P to 69-F2-18P | 10 | 35 microns | 12250 microns or 12.25 mm |
| Interarytenoideus Muscle | 69-F1-18P to 69-F2-15P | 10 | 35 microns | 5600 microns or 5.6 mm |
| Lateral Cricoarytenoid Muscle | 69-F1-2P to 69-F1-9P | 10 | 35 microns | 2800 microns or 2.8 mm |
| Posterior Cricoarytenoid Muscle | 69-F1-9P to 69-F3-3P | 10 | 35 microns | 10850 microns or 10.85 mm |
| Thyroarytenoid Muscle | 69-F1-2P to 69-F2-6P | 10 | 35 microns | 8050 microns or 8.05 mm |
| Conus Elasticus | 69-F1-2P to 69-F2-3P | 10 | 35 microns | 7000 microns or 7.0 mm |
| Thyroid Cartilage-- Superior Apexes Present | 69-F1-2P to 69-F2-6P | 10 | 35 microns | 8050 microns or 8.05 mm |
| Thyroid Cartilage-- Inferior Prominences Present | 69-F1-2P to 69-F2-10P | 10 | 35 microns | 9450 microns or 9.45 mm |
| Body of Thyroid Cartilage | 69-F1-2P to 69-F2-10P | 10 | 35 microns | 9450 microns or 9.45 mm |
| Vibratory Mass-- Thyroarytenoid to Thyroid Cartilage | 69-F1-2P to 69-F2-3P | 10 | 35 microns | 7000 microns or 7.0 mm |

Table D-12--continued.

| Structure | Slide Range | Number of Microtome Passes | Unit of Measure | Total Anterior to Posterior Distance |
|---|---|---|---|---|
| Area of Vibratory Mass | 69-F1-2P to 69-F2-3P | 10 | 35 microns | 7000 microns or 7.0 mm |

NOTE: Coronal Plane: The missing dimension dictated by this plane is the anterior-posterior distance. This table is a summation of that distance.

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